SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 10
MAY 15, 1974

W74-04851 -- W74-05400

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Deoartment of the Interior

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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SUBJECT INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

CLUSTERING IN SUPERCOOLED WATER,
Cryobiology Research Inst., Madison, Wis.
D. H. Rasmussen, and A. P. MacKenzie.
Journal of Chemical Physics, Vol 59, No 9, p 5003-5013, Nov. 1, 1973. 10 fig, 1 tab, 29 ref.

Descriptors: *Supercooling, *Water properties, *Water structure, *Specific heat, *Density, *Heavy water, Theoretical analysis, Cooling, Temperature, Thermal capacity, Thermal properties, Molecular structure, Physical properties, Physicochemical properties, Deuterium.

The specific heats and densities of supercooled water and heavy water have been measured from the respective melting points to the respective homogeneous nucleation temperatures. The calorimetric measurements indicate structural contributions to the differences between the specific heats of the liquids and the corresponding crystals. These 'structural specific heats' are exponential functions of the supercooling. The results are interpreted in terms of Frenkel's heterophase fluctuation theory. It is concluded that, during supercooling, water molecules tend to form icelike clusters incorporating six or more monomers. (Brown-IPC)
W74-05251

2. WATER CYCLE

2A. General

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
D. W. Green, E. C. Pogge, R. M. Knapp, B. Schorn, and C. Stanford.
Available from the National Technical Information Service as PB-229 501, $5.75 in paper copy, $1.45 in microfiche. University of Kansas Center for Research, Inc., Lawrence, Completion Report, August 1973. 193 p, 39 fig, 7 tab, 38 ref, 2 append. OWRR C-2039(No 3357) (1). 14-31-0001-3357.

Descriptors: *Computer models, *Groundwater basins, *Streamflow forecasting, *River basins, *Surface-groundwater relationships, Groundwater recharge, Groundwater, Base flow, Aquifers, Routing, Hydrologic budget, Soil water movement, Hydrologic cycle, Model studies, Water resources development, *Simulation analysis, *Kansas, Water management(Applied).
Identifiers: Numerical modeling, Stream-aquifer interaction, Stream basin, Surface-groundwater interactions, Basin evapotranspiration, *Little Arkansas River basin(Kan).

A digital computer model was developed to describe the hydrology of a stream basin and associated aquifer. The model simulates both surface-water and ground-water phases and their interaction. Input to the model includes precipitation, climatic conditions, boundary and initial conditions, and basin constants. Provision has been made for modeling withdrawals from both groundwater and surface waters for consumptive use. The computer output includes streamflow hydrographs at selected points, groundwater levels, and summaries of important moisture fluxes. The model was successfully tested by using it to simulate the hydrologic behavior of the Little Arkansas River basin in south-central Kansas. The model was used to simulate the 25 years from 1946 to 1970. The results of the simulation were evaluated by comparing the calculated daily discharges to actual streamflow data and the computed groundwater levels to observation well data at sixteen observation sites for the 25-year period. The groundwater heads at the end of 1970 were also compared to a piezometric survey completed in the spring of 1971. The simulation results were considered quite good. Complex hydrologic features in the groundwater were maintained within the accuracy of the simulator and the time response of the groundwater heads in the observation wells closely followed the actual behavior of those wells. With the exception of extreme weather conditions, the computed basin discharges approximated the behavior of the actual basin.
W74-04984

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05141

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
G. A. Grinevich, N. A. Petelina, and A. G. Grinevich.
Izdatel'stvo 'Nauka', Moscow, 1972. 183 p.

Descriptors: *Hydrographys, *Runoff, *Floods, *Model studies, *Statistical methods, Correlation analysis, Histograms, Probability, Stochastic processes, Markov processes, Variability, Fluctuations, Seasonal, Wet seasons, Dry seasons, Distribution patterns, Flood waves, Flood discharge, Curves, Equations.
Identifiers: USSR, Nomograms.

Processes in the grouping of wet and dry years on rivers are examined, and improved method of statistically describing and of modeling long-term and seasonal fluctuations of runoff are described. Possibilities are discussed for obtaining and considering additional information for more accurate estimation of the probability of development of different (including extremal) hydrologic situations on rivers, such as catastrophic floods, groups of dry and wet years, and runoff deficits. (Josefson-USGS)
W74-05146

2B. Precipitation

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
G. W. Elliott.
Technical Memorandum EDS BOMAP-10, July 1973. 9 p, 5 fig, 2 ref.

Descriptors: *Salinity, *Mixing, *Sea water, *Rainfall intensity, Data collections, Atlantic Ocean, Oceanography, *Precipitation intensity.

An investigation was made during the Barbados Oceanographic and Meteorological Experiment (BOMEX) in 1969 to evaluate the possibility of determining total precipitation from the change in salinity or temperature at the ocean surface. Salinity-temperature-depth (STD) soundings were taken at 3-hr intervals during periods of no rain, and at 5- to 6-min intervals during periods of rain. During periods of no rain, salinity regularly fluctuated by 0.015%. Fluctuations of this magnitude are likely to obscure possible salinity depressions due to rainfall. No rainfall-related long-term salinity depressions were evident. Many sharp, short-term depressions of salinity, on the order of 10 to 45 min, however, were observed during periods of rainfall. (Knapp-USGS)
W74-04921

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D. C.
For primary bibliographic entry see Field 2J.
W74-04969

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8B.
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

RAINFALL INTENSITIES IN ISRAEL,
Z. Schein, and N. Buras.
Israel Journal of Earth-Sciences, Vol 22, p 15-30, 1973. 3 fig, 5 tab, 10 ref.

Descriptors: *Depth-area-duration analysis, *Depth-area curves, *Rainfall, Arid lands, Distribution patterns, Probability, Frequency analysis, Hyetographs, Hydrologic data, Data collections, Climatic data, *Arid climates.
Identifiers: *Israel.

Rainfall-depth-duration-probability relations and regional rainfall distributions were developed for Israel from 17 recording gages with 14-33 years of records. Monthly probabilities for daily and shorter duration rainfall were estimated from five selected stations with long-term records. (Knapp-USGS)
W74-05123

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
D. H. Urie.
Available from NTIS, Springfield, Va. 22151, PB-223 489, Price $2.75 printed copy; $1.45 microfiche. Forest Service Research Note NC-120, 1971. 4 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Snowfall, *Precipitation(Atmospheric), *Orography, *Lake Michigan, Topography, Water balance.
Identifiers: *Udell Hills(Mich).

Snow squall concentration in the Udell Hills of Michigan illustrates the effects of minor topographic features and the proximity of Lake Michigan on the seasonal distribution of precipitation. Water budget studies in areas of similar topography can use the relationships developed in this study. (Knapp-USGS)
W74-05124

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
S. T. Wu, and A. K. Fung.
Available from NTIS, Springfield, Va. 22151, NASA CR-2329, Price $4.50 (domestic); $7.00 (foreign) $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2329, November 1973. 146 p, 35 fig, 11 tab, 127 ref, append. NASA Contract NAS 1-10048.

Descriptors: *Microwaves, *Water temperature, *Remote sensing, Waves(Water), Meteorological data, Data collections, Weather data, Winds, Oceans.
Identifiers: *Microwave radiometry.

In the microwave region combined active (scatterometer) and passive (radiometer) remote sensors over the ocean show promise of providing surface wind speeds and weather information. Several approaches to the problem are now available, but none satisfactorily predict both the scattering and emission characteristics of the sea surface. The disagreement may be accounted for at least in part by the use of an improper surface model. A composite surface scattering theory is investigated as a more realistic approach. A two-scale scattering theory was extended to compute the emission and scattering characteristics of ocean surfaces. The effect of the small irregularities upon the scattering characteristics of the large undulations is included by modifying the Fresnel reflection coefficients; the effect of the large undulations upon those of the small irregularities is accounted for by averaging the scattering cross sections of the small irregularities over the surface normals of the large undulations. The wind dependent parameters of the theory are established by comparing the emission characteristic with measurement and by using measured sea slope data. Improved agreement with measured scattering and emission results over a single-surface theory is demonstrated by the composite theory. The effects of clouds and rain on the radiometer and scatterometer observations were also investigated using horizontally stratified model atmospheres with rough sea surfaces underneath. For heavy rainfall rates the effects of scattering on the radiative transfer process are included. Clouds and rains cause the radiometer to lose contact with the surface when clouds or rain intervene. However, the rise of apparent temperature can be used to compute the atmospheric attenuation and the scatterometer measurement can be corrected accordingly. (Knapp-USGS)
W74-05126

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
B. K. Handa.
Indian Geohydrology, Vol 9, No 1, p 31-37, June 1973. 2 tab, 23 ref.

Descriptors: *Water chemistry, *Rainfall, *Chemistry of precipitation, Water quality, Provenance.
Identifiers: *India(Chandigarh).

In rainwater over Chandigarh, India, bicarbonate ions and calcium ions are pre-eminent, so that the rainwater is primarily of the CaHCO3 type. The concentration of potassium ions is quite low but sometimes exceeds that of sodium ions. The weight ratio SO4/Cl also in some cases exceeds unity. Although the chloride ions are supposed to be mainly of marine origin, a comparison of the chemical analysis data of seawater with that of rainwater over Chandigarh shows that there is little resemblance between the two. However, the river water generally shows a great similarity to rainwater in the relative proportions of the various ions. The chemical composition of the rainwater varies quite irregularly. (Knapp-USGS)
W74-05130

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05143

20-24 YEAR CYCLE IN THE MARCH OF ATMOSPHERIC PRECIPITATION AND ITS RELATION TO AIR CIRCULATION PATTERNS (TSIKL 20-24 GODA V KHODE ATMOSFERNYKH OSADKOV I YEGO SVYZA' S OSOBENNOSTYAMI ATMOSFERNOY TSIRKULYATSII),
Leningrad State Univ. (USSR)
L. A. Kudryavtseva.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 87-93, March 1973. 1 fig, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Air circulation, *Cycles, *Meteorology, Cyclones, Anticyclones, Correlation analysis, Forecasting, Curves.
Identifiers: *USSR.

Results are presented of a study of a 20-24 year cycle of precipitation over the USSR and of its relation to air circulation patterns. A 20-24 year cycle in the march of precipitation is manifested over a relatively large expanse of the USSR during warm and cold periods of the year and determines the general moisture background of these areas. The appearance of a 20-21 year cycle in the march of precipitation during the warm period over central regions of the Urals and West Siberia is due to regeneration processes and is expressed by the number of days with precipitation greater than or equal to 10.0 mm in a 24-hour period. The 20-24 year cycle can be used to prepare a long-term precipitation forecast. (Josefson-USGS)
W74-05149

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
J. C. Rodda.
Report No 17, A WMO contribution to the International Hydrological Decade (IHD), 1973. 278 p.

Descriptors: *Rain gages, *Instrumentation, *Precipitation gages, *Bibliographies, Abstracts, Measurement.

Precipitation measurement is the subject of this bibliography. Few, if any, entirely new instruments and techniques are featured in this report. Perhaps the most novel are the optical devices that look at the falling drops and flakes, but there is far greater emphasis on the development of existing methods. The measurement of snow is a problem that still remains to be solved, and this also applies to the other less common forms of precipitation. A large number of studies have been conducted to investigate the sources of error in precipitation measurement, the majority being concerned with those affecting the assessment of rain. (Knapp-USGS)
W74-05169

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

2C. Snow, Ice, and Frost

THE EFFECT OF IMPURITIES ON THE MECHANICAL PROPERTIES OF ICE SINGLE CRYSTALS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
T. Nakamura, and S. J. Jones.
Scientific Series No 24, 1973. 29 p, 45 fig, 3 tab, 32 ref.

Descriptors: *Ice, *Cryology, *Mechanical properties, *Stress strain, Crystallography, Aqueous solutions, *Tensile stress, Tensile strength, Ions.

Constant strain-rate tensile tests were carried out on single crystals of ice doped with various impurities including HF, HCl, HBr, NH4F, NaF, KF, NaOH, H2O2, NH4OH, and He. The tests were carried out in the temperature range of -5 deg C to -53 deg C. HF-doped crystals showed a softening effect in this temperature range as well as in the lower temperature range previously reported. HCl-doped crystals showed a less pronounced softening effect than HF. H2O2-doped crystals showed a softening effect at -26 deg C, one He-doped crystal showed a hardening effect at -15 deg C, and the other impurities had no apparent effect. An activation energy for pure ice of 18 plus or minus 2 kcal/mole was deduced; for HCl-doped ice an activation energy of 12 plus or minus 3 kcal/mole and 13 plus or minus 2 kcal/mole was found using two methods of analysis. A power law relationship between stress and strain-rate was found to hold for pure and HCl-doped crystals with n = 1.73 plus or minus 0.07. The distribution of fluorine and chlorine ions in the crystals showed marked increases in ion concentration towards the surface. (Knapp-USGS)
W74-04914

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W74-04940

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
For primary bibliographic entry see Field 2G.
W74-05019

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.

For primary bibliographic entry see Field 4A.
W74-05104

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2B.
W74-05124

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
T. N. ,Makarevich, Z. A. Yefimova, and L. K. Savina.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 3-24, Leningrad, 1972. 7 fig, 4 tab, 45 ref, append.

Descriptors: *Ice, *Ice cover, *Forecasting, *Meteorology, Atmosphere, Air temperature, Atmospheric pressure, Air circulation, Synoptic analysis, Seasonal, Probability, Histograms, Curves.
Identifiers: *USSR(Danube River).

Problems relating to forecasts of the degree of severity of winters and of the duration of ice phenomena on the Danube River were investigated. Studies were made of the recurrence and probability of duration of ice phenomena for 4 unregulated reaches of the Danube from Bratislava to the river mouth between 1900 and 1968. The duration of ice phenomena on the Danube is closely related to air temperature in winter in Central Europe. Long-range forecast procedures were based on data on changes in the pressure field over Canada (1949-67) using the index of zonal circulation and on ground pressure data using the coefficient of expansion of pressure fields into natural components (1938-67). Forecast procedures based on use of the index of zonal circulation are preferred, and solutions obtained for the Lower Danube are more accurate than those for the Middle Danube because of the regime characteristics of the river's lower reaches and the greater continentality of the part of the basin. (See also W74-05141) (Josefson-USGS)
W74-05142

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. Ya. Alekseyenko.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 57-67, Leningrad, 1972. 3 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Rivers, *Meteorology, Atmosphere, Air circulation, Air temperature, Discharge(Water), Water temperature, Heat balance, Heat transfer, Seasonal, Correlation analysis, Forecasting, Equations.
Identifiers: *Baltic Sea Region, *USSR(Belorussia), Heat exchange.

The influence of major items in the hydrologic and meteorological regimes affecting the date at which ice starts to form on rivers in the Baltic Sea Region and Belorussia was investigated for development of improved long-term ice-growth forecasts. Studies were made of the relation of dates of ice formation to air temperature, stream discharge, water temperature, heat discharge, and total heat exchange between water and the atmosphere. Average monthly air temperature was used for 1901-50 for eastern regions (Velizh, Vitebsk, Daugavpils) and for 1903-50 for western regions (Vilnius, Yelgava), and average 10-day air temperature was used for 1937-67 (for Velizh and Vitebsk) and for 1946-67 (for Daugavpils and Grodno). To determine dates of ice formation, heat transfer from the water surface to air and air circulation processes must be considered. (See also W74-05141) (Josefson-USGS)
W74-05143

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. A. Nezhikhovskiy, and N. P. Sakovskaya.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 68-83, Leningrad, 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Ice jams, *Forecasting, Ice breakup, Discharge(Water), Inflow, Floods, Flood waves, Water levels, Profiles, Correlation analysis, Curves, Equations.
Identifiers: The maximum level of ice jams in the estuarine region of the Severnaya Dvina River, especially near Arkhangel'sk, is determined primarily by the rate of water discharge during the period of ice breakup on the river. A close empirical relation is established between the maximum level of ice jams and both the water discharge of the river at Abramkovo village and lateral inflow in the Abramkovo-Arkhangel'sk reach on the same day. The forecast is timed to coincide with the last day of thick, continuous ice cover at Abramkovo and can be made, on the average, 5-7 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05144

THEORY OF METAMORPHISM OF WET SNOW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Research Report 313, December 1973. 11 p, 7 fig, 13 ref.

Descriptors: *Snow, *Crystal growth, *Cryology, Avalanches, Melting, Freezing, Snowmelt, Permeability, Porosity, Temperature.
Identifiers: *Snow metamorphism.

Metamorphism by grain growth, bond growth, and densification of wet snow are described in terms of the distribution of equilibrium temperature in the snow matrix. At high water saturations the equilibrium temperature increases with grain size; hence, small particles melt away as large particles grow. Melting also occurs at the intergrain bonds, causing a low strength and rapid densification. At low saturations the equilibrium temperature is determined by the capillary pressure and the particle sizes have only a second order effect. Therefore, grain growth proceeds slowly and, even at large overburden pressures, no intergrain melting occurs. At low saturations the water tension acts through a finite area, thus large attractive forces exist between the grains, and the strength of the snow matrix is large. The behavior of wet snow governs the release of wet-snow avalanches and water runoff through seasonal snowpacks. The performance of oversnow vehicles and construction on snow covers are matters of practical necessity involving wet snow as a material. (Knapp-USGS)
W74-05154

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
C. A. Paulson, and J. D. Smith.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 1-8, January 1974. 1 fig, 5 ref.

Descriptors: *Sea ice, *Movement, Currents(Water), Winds, Navigation, Heat transfer, Freezing, Convection, Heat flow, *Alaska.
Identifiers: Leads(Icepacks).

To study sea-ice movement, an open-lead experiment is planned. Atmospheric and oceanic observations are made at a newly created lead offshore from Barrow, Alaska. The atmospheric observations attempt to measure the vertical flux of heat and determine its relation to air-sea temperature difference, fetch, height, and wind speed. The oceanic observations seek to determine the characteristics of the density-driven convection in the vicinity of a lead by measuring the oceanic velocity and density fields. (Knapp-USGS)
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. L. Hunkins.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 9-36, January 1974. 17 fig, 1 tab, 11 ref. ONR Contract N00014-67-A-0108-0016.

Descriptors: *Eddies, *Arctic Ocean, *Ocean currents, Currents(Water), Mixing, Salinity, Density stratification, Turbulence, Vortices.

Transient undercurrents associated with eddies in the Arctic Ocean were observed at depths between 50 and 300 m. The velocity profile was parabolic with a maximum of 40 cm/sec at 150 m. A distortion of the salinity and temperature field accompanied these currents, and gradient equilibrium was closely approached in each case. The eddies persisted for several days. They were 10 to 20 km in diameter and were separated by 20-50 km. The eddies have their origin in the instability of the basic baroclinic current. A large-scale horizontal salinity gradient is produced by global conditions of oceanic precipitation-evaporation and modified by wind conditions. The currents accompanying such a density gradient are not stable but rather lead to growing disturbances. As the disturbances amplify, the potential energy of the horizontal density gradient is converted into the kinetic energy of eddies. (Knapp-USGS)
W74-05159

A RELATION BETWEEN THE POTENTIAL ENERGY PRODUCED BY RIDGING AND THE MECHANICAL WORK REQUIRED TO DEFORM PACK ICE,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 45-51, January 1974. 5 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: Ice mechanics.

The rate of production of potential energy by mechanical processes that change the thickness distribution of sea ice provides a useful lower bound for the rate of work by the two-dimensional stress in pack ice. A formal relation is derived between the plastic work and the increase of potential energy due to all ridging processes represented by the redistribution function. Since

the redistribution function can depend in general on twotdimensional strain rates, the extension to the two-dimensional case is included without further derivation. (Knapp-USGS)
W74-05160

REDISTRIBUTION FUNCTIONS AND THEIR YIELD SURFACES IN A PLASTIC THEORY OF PACK ICE DEFORMATION,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 53-81, January 1974. 22 fig, 9 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

A large-scale area of pack ice contains ice from zero to many meters thick. As the pack ice deforms, thin ice is ridged into thicker ice, in a way that depends on the strain rate and the instantaneous thickness distribution. The rate of this process is assumed to be proportional to the rate of deformation, and fixed proportions (by area) of the thinner ice are assumed to be ridged into ice of known thicknesses. The amount of this ridging is assumed to depend on the angle whose tangent is the ratio of the shearing rate to the divergence rate. The potential energy required to perform this ridging is equated to the plastic work performed by the horizontal ice stress. The ice is assumed to behave plastically. For stresses inside a yield surface, the ice is rigid. Stresses on the yield surface cause the ice to flow by the rule that the strain rate tensor is normal to the yield surface in stress space. The size of the yield surface depends on the thickness distribution. (Knapp-USGS)
W74-05161

DIMENSIONLESS STRENGTH PARAMETERS FOR FLOATING ICE SHEETS,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 83-95, January 1974. 5 fig, 8 ref. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

The equations governing a floating ice sheet subjected to vertical loading were studied in dimensionless form. In thin sheets, the ratio of transverse shear to bending stress is proportional to the fourth root of thickness, so that bending stress dominates. Thus, simple plate theory, which ignores the deformation due to shear, may be used for ice sheets up to several meters thick. The bending stress in the sheet may be incorporated into a dimensionless strength parameter that depends on the functional form of the loading and Poisson's ratio. Where the loading is one dimensional, the strength parameter depends only on the form of the loading. The more complex problem in which in-plane forces interact through the vertical deformations to create additional loading was also studied. This class of problems includes problems of elastic buckling. The problem of the rafting of ice, in which one sheet overrides another without breaking, is an example. The stress parameter is calculated as a function of the geometry of the rafting sheet. If the actual strength of the ice is such that the strength parameter falls below the solution curve, the ice will break before it rafts. The maximum thickness of ice that can raft without breaking depends on the square of the ice thickness. The calculation of 17 cm for typical young sea ice agrees well with field observations, although older ice, because of its greater strength, can raft when it is several meters thick. (Knapp-USGS)
W74-05162

A MECHANICAL MODEL OF RAFTING,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 97-115, January 1974. 6 fig, 8 ref, append. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Rafting(Sea ice).

The simple rafting of two ice sheets of equal thickness is investigated. The force required to initiate rafting is small compared to the force required to buckle the ice sheet. Maximum stresses occur in the submerged portion of the overridden sheet. As the thickness of the sheets is increased, the maximum stress developed during rafting increases. Thus, there exists a critical ice thickness at which rafting causes the overridden sheet to fail. Ice thicker than this critical value will fail and therefore cannot raft. The ice blocks that are broken from the sheet during failture of rafting provide rubble, which then produces a ridge structure. Thus, thick ice tends to deform through ridging and thin ice tends to raft. (Knapp-USGS)
W74-05163

ON THE CALCULATION OF THE ROUGHNESS PARAMETER OF SEA ICE,
Washington Univ., Seattle. Div. of Marine Resources.
C-H. Ling, and N. Untersteiner.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 117-125, January 1974. 4 fig, 1 tab, 14 ref. NSF Grant GV-28807, NSF Grant C-625.

Descriptors: *Sea ice, *Air-water interfaces, *Roughness coefficient, Boundary processes, Winds, Movement, Friction, Turbulent flow, Topography.
Identifiers: *Roughness(Mechanical), Ice dynamics.

A method is described for calculating the roughness parameter of sea ice from velocity profiles. Instead of the conventional procedure of determining an individual roughness for each velocity profile, this method uses a number of profiles to find a single value. By means of a set of data obtained in the Arctic, it is shown that the method greatly reduces the scatter in roughness and produces consistent values for the friction velocity. (Knapp-USGS)
W74-05164

CLASSIFICATION AND VARIATION OF SEA ICE RIDGING IN THE ARCTIC BASIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, S. J. Mock, and W. B. Tucker, III.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 127-146, January 1974. 5 fig, 6 tab, 16 ref, append.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties, *Arctic.
Identifiers: *Ridging(Sea ice).

A one-parameter model for pressure ridges agrees well with more than 3000 km of laser profile data taken from November 1970 to February 1973 in the Arctic basin. Ridging intensity may be determined for a region from the mean number of ridges per unit length and the mean ridge height. Using ridging intensity the number of ridges per kilometer at any ridge height level may be predicted. Although magnitudes of ridging intensity vary in time, the relative regional variations are similar. Consequently, three distinct regions of ridging intensity having relatively stable boundaries can be defined. Annual variation in new ice production due to ridging is sufficiently large to suggest that ridging plays an important role in the overall mass balance of the Arctic basin. (Knapp-USGS)
W74-05165

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 2E.
W74-05166

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. R. Lange.
Technical Report 245, December 1973. 26 p, 5 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Core drilling, *Permafrost, *Frozen ground, Boreholes, Cores, Drilling fluids, Drilling, Rotary drilling, Sampling, Drilling equipment, Drilling samples.

The problems of obtaining frozen samples by core drilling of perennially frozen gravel and rock were investigated. Most of the core drilling was carried out in ice-bonded, well-graded alluvial gravel with the ground temperature near its freezing point. Both chilled compressed air and oil-based liquids were used as drilling fluids. The details of both successful and unsuccessful coring attempts are reported. Drilling variables such as weight on the bit, rotational velocity, rate of penetration, fluid temperatures, viscosities, flow rates and pressures and mechanical details of the diamond bits are reported. To make the information more widely applicable, calculated values for the pressure on the bit, the lineal velocity range of the diamond points, the force per diamond point, and the uphole velocity of the fluid stream are given. Some core drilling was also successfully accomplished in frozen, fractured rock. With careful control of the drilling variables, good samples of these difficult materials can be obtained at satisfactory drilling rates so long as the material is well bonded by ice. Suggestions are given for improvement of equipment and methods. (Knapp-USGS)
W74-05170

2D. Evaporation and Transpiration

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. J. Rahn.
Available from NTIS, Springfield, Va. 22151, COM-73-11435, Price $3.50 printed copy; $1.45 microfiche. Information Report No 69, May 1973. 23 p, 6 fig, 3 tab, 10 ref.

Descriptors: *Evaporation, *Pennsylvania, *Data collections, Hydrologic cycle, *Evaporation pans, Evaporimeters, Reservoir evaporation, Lakes.
Identifiers: Lake evaporation.

All available sources of pan evaporation data in Pennsylvania are compiled to provide an updated and more detailed analysis than was possible with national maps. Class A pan evaporation is com-

pared to evaporation from lakes and other water bodies. Mean annual pan evaporation ranges from about 48 inches in the lower Susquehanna River region to slightly less than 32 inches in the north-central section of the State. Mean annual lake evaporation follows the same general pattern, from about 36 to less than 24 inches. Mean monthly and seasonal values, 90% probability limits, and observed extremes are summarized for six stations with long-term records. Highest mean monthly pan evaporation occurs in July, ranging from about 5.5 to 7.5 inches. Daily extremes in evaporation losses from pans are estimated to range between zero and 0.6 inch. (Knapp-USGS)
W74-05121

COMPARISON BETWEEN PAN AND LAKE EVAPORATION,
C. E. Hounam.
World Meteorological Organization Technical Note No 126, 1973. 52 p, 7 fig, 12 tab, 27 ref.

Descriptors: Evaporation, *Evaporimeters, Calibrations, *Evaporation pans, Reservoir evaporation, Lakes.
Identifiers: *Lake evaporation.

The simplest and most common means of estimating lake evaporation is on the basis of data obtained from pan and tank evaporimeters. The most important types of evaporimeter that are in use are described, with details of their construction and advice on their use. The factors having an influence on pan and lake evaporation are discussed in relation to the various coefficients that have been developed for converting the evaporation rates from pans and tanks to estimates of lake evaporation. These coefficients vary significantly in space, in time, and in relation to the particular characteristics of the lake in question. A description is given of the methods proposed for correcting them so as to eliminate the effects of such variations. (Knapp-USGS)
W74-05155

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W74-05197

TRANSPIRATION OF THE MAIN TREE SPECIES ON THE BOL'-SHOI USHKANII ISLAND (THE BAIKAL LAKE) IN DIFFERENT SEASONS (IN RUSSIAN),
V. N. Pautova.
Lesovedenie. 6. p 59-62, 1970, English summary.
Identifiers: Islands, Lakes, Pines, Seasons, *Transpiration, *Tree species, *USSR(Lake Baikal).

The characteristics and the order of variation of the transpiration intensity of some tree species are established in their transition from the state of dormancy to that of growth and in the course of the latter. The maximum possible water expenditure by pine needles for 5 winter months in the stands of the Bol'shoi Ushkanii Island is 0.15-0.30 mm. The connection is shown between the transpiration and the age of the plant, shoot, and needles as well as its connection with the tree species.--Copyright 1973, Biological Abstracts, Inc.
W74-05364

2E. Streamflow and Runoff

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 75, No 33, p 6778-6789, November 20, 1970. 4 fig, 5 tab, 32 ref.

Descriptors: *Waves(Water), *Mixing, *Turbulence, Coasts, Beaches.
Identifiers: *Longshore current, Radiation stress, *Wave energy, *Bottom friction, *Surf zone, Nearshore processes.

There exists a simple and precise relationship between the total longshore thrust exerted by the incoming waves on the one hand and their direction and amplitude in deep water on the other. This can be derived either from the concept of the radiation stress, or by a direct evaluation of the momentum flux due to the waves. The local longshore stress due to the waves is very simply related to the local rate of dissipation of wave energy, regardless of whether the dissipation is due to wave breaking or to bottom friction. Hence, using the known relation of breaker height to local depth in the surf zone, one can estimate accurately the local longshore stress due to the waves. When the local longshore wave stress is known, it is possible to write an equation of motion for the longshore current that involves in general both the bottom friction and the horizontal mixing by turbulent eddies. If the horizontal mixing is negligible, the momentum balance gives an exceedingly simple expression for the longshore current. The addition of horizontal mixing generally reduces the current, although not drastically. (Sinha-OEIS)
W74-04943

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 2J.
W74-04960

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
For primary bibliographic entry see Field 2J.
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
For primary bibliographic entry see Field 2J.
W74-04966

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
E. E. Schroeder.
Open-file report, 1973. 297 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Data collections, *Flood data, *Texas, Small watersheds, *Hydrologic data, Flood forecasting, Peak discharge.

Basic hydrologic data are compiled to be used to define the magnitude and frequency of floods for drainage areas of less than 20 square miles in Texas. To accomplish the objective, a network of 150 crest-stage partial-record gages was established. These gages are distributed throughout the State to sample all hydrologic areas and flood-frequency regions as defined by Patterson (1963) and to obtain a representative sample of physical characteristics. Information for unusual peak discharges at ungaged sites is obtained as the opportunity arises. Each gage site is equipped with one or more crest-stage gages and a stage-rainfall recorder. A typical installation consists of two crest-stage gages--one headwater gage and one tailwater gage. Data are being collected at 82 other small-stream stations for other projects, making a total of 232 stations available for this study. During the 1971 water year, annual runoff was deficient in the north, east, and central parts of the State, below average in the west, and average in the south. Runoff at individual sites varied greatly. Several streamflow stations in the southern Edwards Plateau area recorded new peak discharges for the period of record. This occurred during the period Aug. 11-14. No widespread major flooding occurred during the year. Numerous flash floods covering relatively small areas did occur. Tropical disturbances caused heavy rainfall in some coastal areas. (Knapp-USGS)
W74-05107

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
K. T. Iseri, and W. B. Langbein.
Circular 686, 1974. 10 p, 4 fig, 2 tab.

Descriptors: *Rivers, *United States, Distance, *Streamflow, Hydrologic data, Data collections, *Discharge(Water).
Identifiers: *Large rivers(U.S.).

Information on the flow of the 28 largest rivers in the United States is presented for the base periods 1931-60 and 1941-70. Drainage area, stream length, source, and mouth are included. Average discharge is listed at downstream gaging stations. Large rivers are listed in order of average discharge at the mouth, based on the period 1941-70. (Knapp-USGS)
W74-05138

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
K. B. Yuen.
Manuscript Report Series, No 33, 1973. 26 p, 11 fig, 6 ref.

Descriptors: *Numerical analysis, *Tides, *Water level fluctuations, Mathematical models, Inlets(Waterways), Water levels, Currents(Water), Seiches, *Canada.
Identifiers: *Causeways.

A one-dimensional mathematical tidal model was constructed which reproduces satisfactorily the normal M2, S2, K1, and O1 tidal constituents in Northumberland Strait, Canada. Calculations for the construction of complete tidal barriers at a range of locations indicated that the vicinity of the Cape Tormentine area is very critical for the semidiurnal constituents, especially for the resulting tide on the eastern side of a causeway. The worst case resulted in an M2 head difference of order 9.0 feet from one side of the causeway to the other, yet a shift of less than 12.0 miles could reduce this to only 5.0 feet. In contrast, the diurnal constituents were relatively insensitive to the exact causeway location. For the Cape Tormentine area, the M2 configuration was also examined for the case of partial barriers. Even for 90% closure, the head difference across the causeway was only 1.0 foot. However, the currents increased with greater closure, but even for 80% closure, the M2 current was only 6.0 feet/sec. (Knapp-USGS)
W74-05140

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05145

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
For primary bibliographic entry see Field 2A.
W74-05146

SEASONAL VARIABILITY OF WATER TEMPERATURE IN THE VICINITY OF THE JAPAN CURRENT (VNUTRISEZONNAYA IZMENCHIVOST' TEMPERATURY VODY V RAYONE KUROSIO),
Leningrad State Univ. (USSR).
P. K. Guber, and V. V. Klepikov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 104-111, March 1973. 2 fig, 2 tab, 12 ref.

Descriptors: *Oceanography, *Water temperature, *Varibility, *Fluctuations, *Seasonal, Thermocline, Heat, Heat balance, Advection, Wind velocity, Currents(Water), Internal waves, Statistical methods, Correlation analysis, Spectroscopy, Curves, Equations, *Pacific Ocean.
Identifiers: USSR, *Japan current(Kuroshio), Ocean weather stations.

Variations in oceanographic conditions were investigated in the region of ocean weather stations 'Extra' ('X') and 'Tango' ('T') in the North Pacific Ocean between July 1951 and November 1953. Intensity and frequency of seasonal fluctuations with time scales ranging from 2-3 days to 3-4 months were determined in the 0- to 1,000-m layer by statistical analysis of water temperature. Seasonal fluctuations of water temperature in the region depend little on fluctuations in the heat balance of the sea surface but are caused mainly by fluctuations in the advection of heat by currents and internal waves. (Josefson-USGS)
W74-05150

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2C.
W74-05159

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
R. A. Brown.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 147-155, January 1974. 1 fig, 19 ref.

Descriptors: *Air-water interfaces, *Winds, *Currents(Water), *Boundary layers, Boundary processes, Ocean currents, Ice, Sea ice.

The classical solutions for the relationship between geostrophic, Ekman layer, and surface layer flow were developed into a continuous solution for the semi-infinite flow over a surface. This solution leads to a two-layer composite boundary layer solution with matching criteria. The matching process indicates a correspondence between the stress and the geostrophic flow deviation involving two arbitrary parameters. Some values of these similarity constants determined from data for neutral and stratified boundary layers are discussed. (Knapp-USGS)
W74-05166

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
G. L. Ducret, Jr., and W. R. Hansen.
Urban Drainage and Flood Control District, Denver, 1973. 40 p, 6 fig, 5 tab, 2 ref, 2 append.

Descriptors: *Floods, *Colorado, Rainfall-runoff relationships, Flood frequency, *Flood data, Hydrologic data, Flood recurrence interval, Peak discharge.
Identifiers: *Denver(Colo).

A light drizzle that began to fall on parts of the Denver metropolitan area late Saturday evening, May 5, 1973, was the forerunner of a general long-duration rainstorm which, by daylight Sunday, had saturated the soils of the area and sent creeks and gullies swelling with runoff. Rainstorm total precipitation ranged from 2.06 to 4.38 inches at U.S. Geological Survey rainfall-runoff stations in the Denver area. By midday on Sunday the small streams had reached their peak discharge; many canal banks, weakened by capacity flows, broke; reservoirs were spilling; and lakes were flooding adjacent areas. Meanwhile, the South Platte River and major tributaries within the storm area were rising toward peak discharges late Sunday night and early Monday morning. The main-stem South Platte River stations from Littleton to Henderson experienced peak discharges ranging in magnitude from that of a 50-year flood to 1.4 times the 50-year flood. (Knapp-USGS)
W74-05171

2F. Groundwater

GEOTHERMAL ENERGY, A NATIONAL PROPOSAL FOR GEOTHERMAL RESOURCES RESEARCH.
Alaska Univ., College.
Available from the National Technical Information Service as PB-216 423; $4.85 in paper copy, $1.45 in microfiche. Final Report of the Geothermal Resources Research Conference, Battelle Seattle Research Center, Seattle, Wash., Sept 18-20, 1972, Alaska University Publication, 1973. 95 p, 4 tab, 123 ref. NSF Project NSF/RA/N-73-003. Grant GI-34313.

Descriptors: *Geothermal studies, *Conferences, Thermal power, Research and development.
Identifiers: *Geothermal energy.

The National Science Foundation, through its RANN Energy Research and Technology Program, supported this geothermal resources research conference under the chairmanship of former Secretary of the Interior Walter J. Hickel. The objective of the conference was to develop an assessment of the state-of-the-art of geothermal science and technology and to recommend a research program to provide the requisite knowledge for establishing the proper role of geothermal resources in providing additional energy to alleviate the Nation's impending shortage. A further objective was to investigate the potential of geothermal water to supplement present national freshwater supplies. The panel topics were: resource exploration, resource assessment, reservoir development and production, utilization technology and economics, environmental effects, and institutional considerations. A research program should include both short range and long range goals. One of the first tasks is to undertake a research program at an adequate level to better define the magnitude of the resource and accelerate its development. Such a program should include: development of binary fluid power-generating systems; development of improved exploration methods; development of desalination methods for geothermal fluids; development of better models of geothermal reservoirs; and development of faster, cheaper methods for deep drilling into hot formations. (Knapp-USGS)
W74-04917

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz.
Available from the National Technical Information Service as PB-228 963, $5.50 in paper copy, $1.45 in microfiche. Auburn University, Alabama. Water Resources Research Institute Bulletin 19, 1974. 46 p, 8 fig, 8 tab, 3 append. OWRR A-029-ALA(1).

Descriptors: Groundwater, *Recharge, *Simulation analysis, *Groundwater movement, Hydrologic budget, *Water table, Aquifers, Computer models, Numerical analysis, Model studies, *South America, *Subsurface flow.
Identifiers: *Colombia(So. Amer.).

Several practical models of the subsurface hydrologic system are constructed. These models have as their core the two-dimensional groundwater flow equation with a vertical recharge term and subject to the assumption of horizontal flow. The recharge term is used to represent the hydrologic processes on the surface and in the unsaturated zone as far as their input to the groundwater system is concerned. In this sense, the models can be used to simulate the subsurface hydrology of a watershed--not simply the groundwater system. Various methods are discussed for evaluating the recharge term including a simple water mass balance, a climatological water balance, a more complex water balance and a recharge distribution based on the USDAHL-70 model of watershed hydrology. Application of several of the models to a watershed in Colombia, South America indicates that the models are relatively easy to apply. Solution is obtained using a program developed by Prickett and Lonnquist (1971) which utilizes an alternating direction, line iteration technique. Flow charts, program listings, and example problems are included.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.

G. A. Maksimovich.
Permskiy Gosudarstvennyy Universitet, Perm, 1969. 530 p.

Descriptors: *Karst, *Karst hydrology, *Bibliographies, Subsurface drainage, Carbonate rocks, Limestones, Caves, Groundwater, Aquifers, Artesian aquifers, Hydrogeology, Areal hydrogeology, Structural geology, Folds(Geologic), Erosion, Springs, Rivers, Lakes, Runoff, Geologic time, Maps.
Identifiers: USSR, *Thermokarst, Karst regions.

Volume 2 of 'Fundamentals of Karst Science' represents an expanded approach to the problems associated with the study of karst. Intended for use by hydrogeologists, geologists, geographers, planners, and other professionals engaged in karst investigations, the book is divided into 3 parts: (1) problems of karst hydrogeology (including general, applied, and regional hydrogeology of karst); (2) rivers and lakes of karst regions; and (3) some special types of karst (chalk karst and hydrothermokarst). An extensive bibliography of Soviet and foreign literature is included. (Josefson-USGS)
W74-05017

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
For primary bibliographic entry see Field 4B.
W74-05131

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
V. Ramesam, and S. K. Barua.
Indian Geohydrology, Vol 9, No 1, p 10-18, June 1973. 2 fig, 12 ref.

Descriptors: *Saline water, *Saline water systems, *Surface-groundwater relationships, Brines, Evaporation, Salinity, Water chemistry, Arid lands, Salts, Evapotranspiration.
Identifiers: *India.

The salinity of surface water bodies cannot be understood independent of the salinity of underlying groundwater. Based on the chemical analytical results of more than 700 groundwater samples from the water table zone of the districts of Kutch, Gujarat, and Jaisalmer, in Rajasthan, India, an attempt was made to understand the mechanism controlling the groundwater chemistry in the arid region of northwestern India. The cation and anion relations with respect to total dissolved solids indicate evapotranspiration and consequent fractional separation of salts as the dominant process rather than proximity to the sea and transportation of saline matter from the sea. (Knapp-USGS)
W74-05132

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 4B.
W74-05133

PREDICTIVE SIMULATION OF THE SUBSIDENCE OF VENICE,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati, P. Gatto, and R. A. Freeze.
Science, Vol 183, No 4127, p 849-851, March 1, 1974. 2 fig, 6 ref.

Descriptors: *Subsidence, *Land subsidence, *Withdrawal, *Artesian aquifers, Compaction, Floods, Seiches, Mathematical models.
Identifiers: *Italy(Venice).

Land subsidence at Venice (Italy) is the result of sediment compaction in the unconsolidated aquifer system that underlies the Venetian Lagoon. Compaction is caused by extensive groundwater withdrawals at the nearby industrial port of Marghera. The total subsidence at Venice for the period from 1930 through 1973 has been about 15 cm. Predictive simulations with a calibrated mathematical model were hampered by the sparseness of available data, but they suggest that if withdrawals are kept constant in the future as they have been since 1969, about 3 cm of further subsidence can be expected. (Knapp-USGS)
W74-05137

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
For primary bibliographic entry see Field 4B.
W74-05139

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
G. F. Larionov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 59-62, March 1973. 17 ref.

Descriptors: *Geochemistry, *Trace elements, *Groundwater, *Dissolved solids, *Salts, Ions, Ion transport.
Identifiers: *USSR(Kazakhstan), Mineralization.

Most investigators contend that the content of trace elements in waters of varied dissolved-solids content is controlled mainly by the product of solubility and stability of their natural compounds, coprecipitation of microadmixtures with relatively insoluble compounds, and the sorption capacity of rocks. Judging from results of experiments and on-site investigations, these factors are significant only when trace element contents considerably exceed their actual concentrations in natural waters and when there is a sudden change in the conditions of the environment. In all probability, the cause of the relation between salt content in solution and trace element concentration should be sought in the internal structure of molecular processes occurring in groundwater. The concentration of negatively hydrated ions, which include most anions and some cations, increases with increasing dissolved-solids content of natural waters. Between positively hydrated ions (which include almost all cations) and dissolved-solids content of the waters, this relation apparently does not exist. (Josefson-USGS)
W74-05147

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 4B.
W74-05331

NUMERICAL AND ANALYTICAL SOLUTIONS OF DISPERSION IN A FINITE, ADSORBING POROUS MEDIUM,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-05334

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-05336

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
For primary bibliographic entry see Field 5B.
W74-05337

2G. Water In Soils

DEGRADATION OF PARATHION BY BACTERIA ISOLATED FROM FLOODED SOIL,
Central Rice Research Inst., Cuttack (India). Dept. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W74-04889

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5A.
W74-04890

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
N. B. Myakina.
Biol Nauki. Vol 15, No 8, p 136-138. 1972.
Identifiers: *Absorption capacity(Soils), *Soil analysis, *Carbonate soils.

The acetate method for determining the absorption capacity in carbonate soils is as accurate as the standard method and requires less time for mass analyses.--Copyright 1973, Biological Abstracts, Inc.
W74-04947

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

COMPARATIVE CHARACTERISTICS OF DESERT SOILS OF USSR AND AUSTRALIA, (IN RUSSIAN),
L. A. Dorokhov.
Probl Osvoeniya Pustyn', 2p 18-31. 1972, (English summary).
Identifiers: *Australia, Claypans, Climates, *Desert soils, Magnesium, Proluvial soils, Salts, *USSR, *Soil comparisons.

In Australia's arid zone, soil evolutionary history differs from that in desert of USSR. Australian soils are developed from lateritic material formed during intensive weathering in a humid period. The paleosubtropical as well as paleotropical conditions have almost no effect on recent soils in arid lands of USSR. The stony tableland soils (solonetz soils) of Australian arid zone have large amounts of Mg, and thus they may be expected to be similar to vertisols, rather than to Middle Asia grey-brown soils. Sandplain and sandridges of Australia are of proluvial origin, whereas the sand expanses in arid parts of USSR are reworked by powerful river courses. The genesis and morphological characteristics as well as salt profile of claypans strongly resemble those of takyrs. Both types of soils are widespread. The modern soils evolutionary processes show evidence of carbonate and sulfate accumulation which seems to be universal.--Copyright 1973, Biological Abstracts, Inc.
W74-04998

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
I. A. Pabat.
Pochvovedeniye, No 12, p 105-113, 1972. 1 fig, 6 tab, 18 ref.

Descriptors: *Land management, *Fallowing, *Erosion control, *Frozen soils, *Soil physical properties, Bulk density, Compaction, Permeability, Infiltration, Infiltration rates, Soil moisture, Moisture content, Melt water, Snowmelt, Runoff, Slopes, Ice, Freezing.
Identifiers: *USSR(Ukraine), *Dibbling.

Field investigations were made of water and air permeability of frozen soil, melt-water runoff, and soil erosion as a function of soil moisture content, snow accumulation, depth of soil freezing, and fallow cultivation practices on slopes in the central steppe of the Ukraine. Dibbling on slopes was found to reduce to some extent the moisture content and compaction of the upper 10-cm layer of soil between the holes and the depth of freezing under them. This increased the water and air permeability of frozen soil during spring snowmelt, thereby reducing runoff and soil erosion by a factor of 2-10. Destruction of the upper water-impermeable soil layer and of the ice crust by dibbling prior to spring snowmelt may prove to be a reliable and promising method of water conservation and erosion control. Effectiveness of the LOD-10 dibbler in controlling water and wind erosion of soils is noted. (Josefson-USGS)
W74-05019

WATER-HOLDING CAPACITY OF COARSE AND MEDIUM LOESSLIKE LOAMS (O VODOUDERZHIVAYUSHCHEY SPOSOBNOSTI LEGKIKH I SREDNIKH LESSOVIDNYKH SUGLINKOV),
L. G. Balayev.
Pochvovedeniye, No 12, p 92-98, 1972. 2 fig, 9 ref.

Descriptors: *Soil physics, *Soil moisture, *Retention, *Loam, *Loess, Soil water movement, Capillary action, Field capacity, Wetting, Pore water, Equilibrium.
Identifiers: *USSR(Tadzhikistan-northern Causasus).

Moisture content in the zone of aeration of loess was determined in the Vaksh Valley of Tadzhikistan and in the Northern Caucasus. Pore water of loam and clay soils in the moisture range from minimum moisture capacity to interrupted capillary moisture is capable of moving by gravity in the liquid droplet state. Complete moisture equilibrium occurs in the soils at interrupted capillary moisture. A relation was found between mobility of suspended water and moisture content of the underlying soils. Since suspended water of loam and clay soils at minimum moisture capacity is not in a state of equilibrium, the term 'minimum moisture capacity' should be replaced by that of 'field capacity.' (Josefson-USGS)
W74-05020

COMPARATIVE STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF MELIORATED AND NON-MELIORATED SOILS AT THE MUGAN EXPERIMENTAL MELIORATION STATION, (IN RUSSIAN),
I. S. Iskenderov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 61-65, 1972. Illus.
Identifiers: Alumino-silicates, Filtrability, Hydrophilic, Melioration, *Mineral compounds, *Physicochemical studies, Silicates, *Soils, Swelling, *USSR.

Changes occurred in the hydrophilic properties, filtrability and swelling capacity of the soils in the course of melioration. The mineral component underwent minor changes. Amorphous mineral compounds were more dynamic than the mineral compounds of the aluminosilicate component under melioration and irrigation conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-05037

SOIL RESPIRATION, NITROGEN MINERALIZATION AND HUMUS DECOMPOSITION OF EAST AFRICAN SOILS AFTER DRYING AND REMOISTENING (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 56-66, 1972, English summary.
Identifiers: *Africa, *Humus decomposition, *Mineralization, *Nitrogen, Respiration, *Soils.

Soil respiration and N mineralization of 51 East African cultivated, savanna and forest soils were compared after 3 and 21 wk of air drying. The average soil respiration after 21 wk of drying was 1.221 plus or minus 0.106 times higher than that after 3 wk of drying whereas the average N mineralization was not increased significantly (factor 1.132 plus or minus 0.256). The increase in soil respiration was correlated positively with the water soluble organic matter. During air drying of 3 days and moist incubations of 4 days at 30C, which were repeated 20 times in 10 soils, 3-10% of the organic C and 8-19% of the organic N (low humus vertisol 69%) were mineralized. Changes in the amount and the extinction of humic and fulvic acids were considered to be indicative for an increased humification during the drying and remoistening of soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05054

THE INFLUENCE OF PRECIPITATION AND ALTITUDE ON THE HUMUS CONTENT OF EAST AFRICAN SOILS (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 13-21, 1972, Illus, English summary.
Identifiers: *Africa, Altitude, *Carbon, *Humus, *Nitrogen, Precipitation, *Soils.

Positive correlations were found between the log of the C and N content of the 0-15 cm soil layer, altitude and average annual precipitation of 20 grassland soils, 13 forest soils and 21 cultivated soils at altitudes of 10-2840 m and a precipitation of 380-2410 mm in Kenya, Tanzania and Uganda. For each of the soil groups equations with the 2 variables, altitude and precipitation, were derived, which accounted for 76-93% of the variation of the C (0.42-5.62%) and N (0.04-0.71%) content. There was no correlation between altitude precipitation and the C/N ratio of the soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05058

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2J.
W74-05066

STUDY OF CONDENSED WATER ACCUMULATION IN SANDY DESERT, (IN RUSSIAN),
T. Khodzhamuradov, and M. Kurbannazarov.
Probl Osvoeniya Pustyn'. 2, p 68-70, 1972. English summary.
Identifiers: *Absorption, Condensed water, Deserts, Sands, *Sandy desert, Temperature, Pressure, *Hydroscopicity, *Moisture.

Under the natural conditions, at variable rates of temperature, humidity and pressure, the value of water absorption by sand from the atmosphere exceeds maximum hygroscopicity. During the night atmospheric moisture is accumulated in surface layers and during the day it moves into deeper layers in which diurnal temperature variations occur.--Copyright 1973, Biological Abstracts, Inc.
W74-05115

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
J. Dymond, P. E. Biscaye, and R. W. Rex.
Geological Society of America Bulletin, Vol 85, No 1, p 37-40, January 1974. 1 fig, 2 tab, 19 ref.
NSF Grants GA-30794X and GX-28671(CLIMAP).

Descriptors: *Aeolian soils, *Clay minerals, *Hawaii, Radioactive dating, Quartz, Mineralogy, Provenance, Soil formation.
Identifiers: Mica, *Oahu(Hawaii).

Mica- and quartz-bearing soils from the high-rainfall regions of the island of Oahu were analyzed for their K-Ar and Rb-Sr age to test for an eolian versus pedogenic origin of the mica. K-Ar and Rb-Sr apparent ages are approximately 100 times greater than the age of volcanism on the island. In addition Sr-87/Sr-86 values for mica-bearing soils are as high as 0.7273 and contrast greatly with the nonradiogenic strontium in Hawaiian lavas (0.703 to 0.707). These measurements show that the potassium- and strontium-bearing minerals of the Hawaiian soils are not of local origin and confirm the importance of eolian transport of mica and clays to the North Pacific. (Knapp-USGS)
W74-05136

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
L. L. Dvornikova.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 78-86, March 1973. 5 tab, 7 ref.

Descriptors: *Soils, *Soil moisture, *Excess water(Soils), *Trace elements, *Geochemistry, Copper, Cobalt, Nickel, Manganese, Boron, Soil profiles.
Identifiers: *USSR(Leningrad Oblast).

Relation of the behavior of mobile forms of trace elements Cu, Co, Ni, Mn, and B to degree of soil wetting was investigated in soil profiles taken on a plowland in the northern part of the Ordovikskoye Plateau in Leningrad Oblast. Studies were conducted on plowed soils formed on calcareous and leached moraine loam and on meadow and forest soils developed under similar natural conditions. The effect of excess moisture on trace element content and distribution throughout the profile is most pronounced in Sod- and Peat-Gley soils. In excessively wet Sod-Podzolic soils nickel accumulates throughout the entire profile, while copper accumulates in the lower gleyed horizons. Changes in Mn, Co, and B concentrations are poorly expressed. Trace elements in Sod-Calcareous soils generally react weakly to periodic excess wetting. (Josefson-USGS)
W74-05148

CESIUM-137 SOIL INVENTORY OF A TAGGED LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05193

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05200

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
E. G. Dzhakishev.
Izv Akad Nauk Kaz SSR Ser Biol. 4, p 1-7. 1972.
Identifiers: *Irrigation, Rivers, *Soils, *USSR(Gureo region), *Ural river.

The natural and soil-meliorative conditions of the Ural river region (USSR) are studied. The region is divided into 7 categories according to the degree of suitability to irrigation.--Copyright 1973, Biological Abstracts, Inc.
W74-05205

CONTENT AND COMPOSITION OF ORGANIC MATTER IN SOD PODZOLIC AND SOD SANDY SOILS OF DIFFERENT DEGREES OF WETTING, (IN RUSSIAN),
L. V. Drechina.
Vestn Beloruss Univ 2.2. p 77-82, 1970.
Identifiers: Coniferous forests, Forests, Fulvic-acid, Humic-acid, Humification, Meadow, Nitrogen, *Organic matter, Plowland, *Podzolic soil, *Sandy soil, Sod soils, Wetting.

The composition of organic matter in light-textured soils of different degrees of wetting under coniferous forests, meadow and plowland, is described. The process of humification in forest soils proceeds mainly with the production of fulvic acids. With the progressive increase of wetting, the ratio of humic acid to fulvic acid (Ch:Cf) increases regularly in forest and meadow soils. The concentration of N in soils and in individual groups of organic matter was determined.--Copyright 1973, Biological Abstracts, Inc.
W74-05237

THE POSSIBILITY OF SODA FORMATION IN SOIL BY BIOCHEMICAL MEANS, (IN RUSSIAN),
P. A. Kerzum, S. I. Vasil'chikova, R. G. Gorbunova, and A. F. Zakharchenko.
Dokl Akad Nauk Tadzh SSR. Vol 15, No 9, p 54-56. 1972.
Identifiers: Biochemical processes, *Calcium carbonate, Soda formation, *Soil chemistry, *Calcium sulfate.

Under laboratory conditions, an experiment was conducted to establish meadow conditions with sub-surface waters and organic materials. It was possible, through a series of reactions, to decrease the CaCO3 level while the CaSO4 level increased in the separated horizons of oxidated soil zones.--Copyright 1973, Biological Abstracts, Inc.
W74-05271

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
S. G. Skoropnaov, and V. S. Brezgunov.
Dokl Akad S-Kh Nauk 12. p 20-22. 1972. Illus.
Identifiers: Crop rotation, Drainage, Grain, Grass, Meadow, *Organic matter, *Organogenic soils, *Peat bogs, Reclamation, *Soils, Water storage.

In the reclamation and the agricultural use of organogenic soils (peat bogs), losses of organic matter and transformations of the quality of the organic matter occur. Under certain conditions both factors are undesirable, since the water-storage capacity of the soils decreases. The soil-forming process occurring under the effect of reclamation must be regulated by an optimal degree of draining and by the character of soil use. This is achieved by using the soils for meadow cultivation lowering the groundwater in conformity with the requirements of meadow grasses. The soils may also be used for grain crops-meadow grass rotation.--Copyright 1973, Biological Abstracts, Inc.
W74-05279

HYDRIC REGIME OF AN ARGIUDOL (IN SPANISH),
Universidad Nacional de Tucuman (Argentina).
R. B. Zuccardi, G. S. Fadda, and M. R. Caceres.
Rev Agron Noroeste Argent, Vol 9, No 2, p 347-365, 1972, Illus, English summary.
Identifiers: *Argiudol, *Hydric regime, *Soil moisture.

With slight variations, the period of soil drying starts in May and ends in Oct. In Nov.-April the soil reconstitutes its hydric reserves. These periods coincide in general with the periods of negative and positive hydric balance calculated after Thornthwaite. Small hydric reserves are registered in Oct. The soil normally reaches its highest hydric content in the 50 cm on top in Feb. Hydric contents lower than the wilting point are registered between Sept. and mid-Nov. Moisture contents are high in the surface horizons in Dec.-March.--Copyright 1973, Biological Abstracts, Inc.
W74-05324

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-05343

INVESTIGATIONS ON THE TRANSFER OF BIOELEMENTS FROM ORGANIC MATTER TO SOIL SOLUTION IN THE HUMUS LAYER OF A BEECH STAND (IN GERMAN),
R. Mayer.
Z Pflanzenernaehr Bodenkd, Vol 131, No 3, p 261-273, 1972, Illus, English summary.
Identifiers: Beech, Bioelements, *Humus layers, Leaf, Organic matter, *Soil solution, *Seepage, *Canopy drip, *Input-output analysis, Lysimeters.

Monthly and annual fluxes of bioelements were measured at 2 levels: at the soil surface (= input) and at the lower boundary of the humus layer (= output) by determination of amount and concentration of the precipitation (canopy drip), of the litter and of the seepage. Seepage was collected with funnel lysimeters. By comparison of both fluxes (input-output-analysis) for some bioelements, mathematical equations could be derived which describe the transfer of these elements from organic matter to soil solution. The results are explained as consequence of the different bonds of the elements in leaf tissues and in humus substances.--Copyright 1973, Biological Abstracts, Inc.
W74-05367

EXPERIENCE OF MEADOW SOIL DESALINATION IN MURGAB OASIS (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W74-05368

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05370

SOIL-WATER-POTENTIALS DEPENDING ON TEMPERATURE, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
J. Richter.
Z Pflanzenernaehr Bodenkd. Vol 131, No 3, p 254-261. 1972. Illus. (English summary).
Identifiers: *Hysteresis, *Soil water potentials, *Temperature, Clay, Sand.

The soil-water potential of different soils was measured. At -200,000 and -700,000 erg/cc all soils showed a significant dependence of the soil-water potential on temperature in connection with hysteresis phenomena. With soils rich in clay or sand the dependence was most pronounced. At very high suction values (< -700,000 erg/cc erg cm -3) the dependence became small. The measurements agreed well with psychrometric evaluations of Campbell and Gardner on the no-temperature-dependence of the soil-water potential in the range of about -3,000,000 to 20,000,000 erg/cc.--Copyright 1973, Biological Abstracts, Inc.
W74-05372

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05374

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
G. N. Marshunova.
Byull Vses Nauchno-Issled Inst S-Kh Mikdrobiol. Vol 14, No 3, p 88-92. 1970.
Identifiers: *Fertilizers, Lysimetric solutions, Microorganism, *Sod podzolic soils, Soils, *Toxicity(Yeast), Hydrogen ion concentration.

The toxicity of lysimetric solutions from all horizons of sod podzolic soils was greater in March than in April. Toxicity was expressed in percent destruction of epiphytic yeasts in 24 hr. Insignificant fluctuations in the pH of the soil solutions led to differences in toxicity. The number of microorganisms was higher in April than in March in all horizons. Data are reported on the effect of fertilizers upon the concentration of microorganisms and the toxicity for plants of soil and lysimet-

ric solutions. The toxic substances may be washed out or partially adsorbed in different horizons. The toxicity of aqueous soil extracts is usually weaker than that of lysimetric solutions.--Copyright 1973, Biological Abstracts, Inc.
W74-05375

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
I. S. Mot', and A. M. Karpitskii.
Sb Nauchn Tr Grodnenskii S-Kh Inst. 7. p 108-115. 1970.
Identifiers: Aggregates, Density, *Porosity, *Soil properties, *Tillage, *Sod podzolic soils.

Different tillage methods have different effects on the general porosity of the soil. The lowest bulk density and the largest non-capillary porosity were found in the 10-20-cm layer, whereas in the thoroughly cultivated and the shallow tilled variants they occurred in the 0-10-cm layer. Destruction of soil structure occurs in the fall and winter-spring periods. In the summer partial recovery takes place. Irrespective of the tillage methods the water stability of the aggregates in light-loamy sod podzolic soils is inadequate.--Copyright 1973, Biological Abstracts, Inc.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05379

2H. Lakes

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 5C.
W74-05044

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
For primary bibliographic entry see Field 5C.
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-05051

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
For primary bibliographic entry see Field 5C.
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05074

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W74-05121

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

PHILOMETRA NODULOSA IN WYOMING WHITE SUCKERS,
Wyoming Game and Fish Commission, Casper.
For primary bibliographic entry see Field 5C.
W74-05329

BIONOMICS OF CYCLOPS STRENUUS ABYSSORM SARS (COPEPODA:CYCLOPOIDA),
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W74-05344

2I. Water In Plants

REDESCRIPTION OF MAPPATES PLATAXUS RANGNEKAR (COPEPODA: CALIGIDAE),
Kerala Univ., Trivandrum (India). Dept. of Aquatic Biology and Fisheries.
M. S. Hameed, and N. K. Pillai.
Hydrobiologia, Vol 42, No 4, p 403-411, September 28, 1973. 18 fig, 15 ref.

Descriptors: *Copepods, *Systematics.
Identifiers: *Mappates platexus, Anurites, Pseudanuretes, Heniocophilus, Eirgos, Animal morphology.

A detailed description of Mappates plataxus is presented. In the light of the present study it is suggested that the closely allied genera Auretes, Pseudanuretes, Heniochophilus, Mappates, and Eirgos do not show any valid generic difference. The suggestion that they may be considered as subgenera under the genus Anuretes is put forth. (Mortland-Battelle)
W74-04877

THE CHARACEAE OF SOUTHEASTERN UNITED STATES,
Rhode Island Univ., Kingston. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-04879

TAXONOMY, DISTRIBUTION AND ECOLOGY OF THE GENUS SESARMA (CRUSTACEA, DECAPODA, GRAPSIDAE) IN EASTERN NORTH AMERICA, WITH SPECIAL REFERENCE TO FLORIDA,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
L. G. Abele.
The American Midland Naturalist, Vol 90, No 2, p 375-386, October 1973. 1 fig, 2 tab, 12 ref.

Descriptors: *Systematics, Ecology, *Ecological distribution, Habitats, Crustaceans, Speciation, Spatial distribution, *Crabs, Invertebrates, *Florida, North America, Marine animals.
Identifiers: *Shore crabs, *Sesarma, Animal morphology, Macroinvertebrates, Driftline crab, Sesarma (Holometopus) cinereum, Sesarma (Holometopus) ricordi, Sesarma (Holometopus) benedicti, Sesarma (Holometopus) miersii, Sesarma (Sesarma) reticulatum, Sesarma (Sesarma) curacaoense, Decapods.

Six species of the grapsid crab genus Sesarma are reported from eatern North America. A key for their identification is presented and their diagnostic characters are illustrated. Their distributions in the western Atlantic are reviewed and a map is given of their distributions in Florida, an area where all six species occur. Field observations on the biology and ecology of four species are presented. Character divergence occurs between two closely related, partially sympatric species. Several factors are suggested to account for the observed patterns of distribution. (Holoman-Battelle)
W74-04880

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
G. V. Trotsenko.
Ekologiya. Vol 3, No 5, p 90-93. 1972.
Identifiers: Phenology, *Phytomass reserves(Trees), Rivers, *Tundra, *USSR(Ob River), *Tree types(Root systems).

Phytomass reserves were determined in tree types of tundra near the Ob river (USSR). Aboveground and root systems were measured and the phytomass determined. The beginning of August was the peak of agreement with data of phenological studies. There was less reserve in the shoot than in the root system.--Copyright 1973, Biological Abstracts, Inc.
W74-04940

ALTITUDINAL VARIATION OF CHLOROPHYLL CONCENTRATION AND REFLECTANCE OF THE BARK OF POPULUS TREMULOIDES,
New Mexico Univ., Albuquerque. Dept. of Biology.
W. W. Covington.
Available from the National Technical Information Service as PB-228 873, $4.75 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 32 p, 4 fig, 3 tab, 22 ref. OWRR A-039-NMEX(1).

Descriptors: *Photosynthesis, *Bark, *New Mexico, *Reflection, Deciduous trees, Forests, Elevation, Altitude, Ecosystems, *Chlorophyll, Trees, Plant tissues, Plant pigments, Deciduous forests, Mountain forests, Plant physiology, *Cottonwoods.
Identifiers: Quaking aspen, *Populus tremuloides, Corticular photosynthesis, Corticular chlorophyll.

Chlorophyll concentration and reflectance of bark samples of Populus tremuloides Michx. growing at various elevations in the Sangre de Cristo mountain range of New Mexico indicate that the appearance of greener barked trees at higher elevations is due to the reflectance characteristics of a bloom of dead periderm cells and not to increased chlorophyll concentrations. Chlorophyll concentrations in aspen bark were, in fact, inversely correlated with altitude. The higher concentration of chlorophyll at lower elevations is effectively masked by a white bloom which is also characteristic of exposed site trees. At higher elevations the bloom is yellow-brown and more translucent thus allowing the chlorophyll layers beneath to show through. Therefore, trees at higher elevations appear greener even though they have lower corticular chlorophyll concentrations. The ecological significance of altitudinal variations in chlorophyll concentrations and reflectance of aspen bark is discussed. (Creel-New Mexico)
W74-04977

THE RELATIONSHIP OF SOIL TEMPERATURE AND CYTOKININ PRODUCTION IN ASPEN INVASION,
New Mexico Univ., Albuquerque. Dept. of Biology.
K. R. Williams.
Available from the National Technical Information Service as PB-228 870, $5.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 39 p, 5 fig, 2 tab, 33 ref. OWRR A-039-NMEX(2).

Descriptors: *New Mexico, *Soil temperature, *Reproduction, *Invasion, Soil analysis, Temperature, Root development, Deciduous trees, Forests, Trees, Deciduous forests, Mountain forests, Soil moisture, Soil-water-plant relationships, Vegetation regrowth, *Cottonwoods, Regression analysis.
Identifiers: *Cytokinin, *Aspen invasion, Populus tremuloides, Quaking Aspen, Thermal regulation, Sprouting.

Quaking aspen (Populus tremuloides Michx.) primarily reproduce by suckering (i.e., root sprouting). Numerous environmental variables have been suggested as causes of this phenomenon, the most notable of which is soil temperature. Studies demonstrating thermal regulation of sprouting indicate the involvement of growth hormones. The only class of hormones to elicit a response similar to sprouting is the cytokinins. Other hormones, no doubt, function in this process as well (e.g., auxins). To substantiate the idea that thermal regulation of sprouting is primarily a function of thermal regulation of cytokinin activity, and to determine the importance of other environmental factors in this scheme, various measurements of field conditions and several laboratory experiments were employed. Regression analyses results indicated that in this subalpine meadow, 91.9% of the variation in soil moisture was accounted for by the silt percentage, and 66% of the variation in soil temperatures was accounted for by soil moisture. Significant relationships exist between numbers of sprouts invading the meadow and soil temperature at each position. Laboratory experiments showed that there exist 'cause-effect' type relationships between soil temperature, cytokinin levels, and sprout production of root sections, and when no factor is severely limiting, sprouting and generally aspen invasion is primarily a thermally controlled process. Thermal control is accomplished through alteration of cytokinin activity levels. (Creel-New Mexico)
W74-04978

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05188

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05196

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
For primary bibliographic entry see Field 5C.
W74-05345

INFLUENCE OF SOIL WATER LOGGING DURING SPRING, FOLLOWED BY SUMMER DRYNESS, ON THE BEHAVIOR OF YOUNG PLANTS OF NORWAY SPRUCE, (IN FRENCH),
G. Levy.
Ann Sci For. Vol 28, No 4, p 403-423. 1971. (English summary).
Identifiers: Dryness, Growth, Height, Mortality, Nutrition, Plants, Rooting, *Soil water, Spring, *Spruce(Norway), Summer, Waterlogging.

A greenhouse experiment was conducted using large pots filled with pseudogley soil (A1 and A2)

horizons. There were 4 spring treatments (soil at field capacity, level of water table 7, 14 or 21 cm below the soil surface) and 3 summer treatments (soil at field capacity, watered once a month, watered twice a month) giving a combination of 12 treatments. Data were recorded on highest growth, rooting, mortality and nutrition. A shallow water table in spring followed by severe summer drought was the most unfavorable. All waterlogged roots dried but regrowth took place in summer.--Copyright 1973, Biological Abstracts, Inc.
W74-05348

MICROCLIMATIC CONDITIONS ON THE CUTOVER AREAS OF SHELTERWOOD CUTTINGS, (IN RUSSIAN),
V. E. M. Maksimov.
Nauchn Tr Leningr Lesotekh Akad. 127, p 31-34. 1970.
Identifiers: *Climatic conditions, Cut-over areas, *Cuttings, Humidity, Light, Shelterwood, *Spruce, Temperature.

Indexes of the annual increment of spruce advance growth in 1957-1966 are presented after the initial and the final stages of shelterwood cuttings. The influence of varying conditions of light, temperature and humidity of air and of soil is considered.--Copyright 1973, Biological Abstracts, Inc.
W74-05349

THE PROBLEM OF THE MICROCLIMATE OF THE DRY PINE FOREST, (IN RUSSIAN),
B. M. Kavalyauskas, and I. S. Tomkus.
Liet Tse Modsiu Akad Darb Ser B. 2, p 237-244. 1970. (English summary.).
Identifiers: Air humidity, *Climates, Dry forest, *Pine forests, Radiation, Temperature, Velocity, Winds, *USSR(Lithuania).

Results of the actinometric and gradient meteorological observations in 1968 in a dry pine forest and on an open field in southern Lithuania, USSR, are presented. Only 41% of the total incoming solar radiation reached the forest floor under the pine canopy. The ratio of diffused radiation to the total radiation was 39% in the field, and 50% under the canopy. The average values of the daily totals of radiation balance were 81% lower than in the open field due to the difference in the amount received and the characteristics of the forest floor surface. Data on the temperature of the ground surface and of the air at the height of 0.2 and 1.5 m and the relative humidity of the air showed that the differences between the forest and the field were unimportant. Differences of meteorological data obtained in different weather conditions were important: after rain periods it was colder in the forests than in the field. This was due to difference in wind velocity and in the value of the turbulence coefficient, as well as in the expenditure of heat in warming up the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05350

AN EXAMPLE OF LONGEVITY OF PINE ON A PEAT BOG, (IN RUSSIAN),
V. G. Rubtsov.
Lesovedenie. 6. p 104-107, 1970. (English summary).
Identifiers: Bogs, Drainage, Morphology, *Peat bog, *Pine longevity, Sphagnum.

Studies were conducted in a 230-yr-old shrub-Sphagnum pine forest. The geomorphological structure of the bog is characterized by drainage and a comparatively high trophic value of the peat. It differs from similar bogs which are confined to the watersheds and hillocky dunes, where the trophic value of peat is low. Shrub-Sphagnum pine forests react differently to drainage depending on the geomorphological structure of forest transitional bogs.--Copyright 1973, Biological Abstracts, Inc.
W74-05351

CONTRIBUTION TO THE METHOD FOR THE DETERMINATION OF SUBLETHAL WATER DEFICIT,
P. Weinberger, M. Romero, and M. Oliva.
Flora (Jena), Vol 161, No 5/6, p 555-561, 1972, Illus, English summary.
Identifiers: Methods, *Sublethal limit, *Water deficit, *Saturation.

The sublethal water deficit is a highly variable feature. By a common statistical procedure, determination of the correlation between water deficit and reachable re-saturation, it is possible to establish a specific value of each species, this value being easily reproducible. This corresponds to a re-saturation of only 90% of the initial maximum value.--Copyright 1973, Biological Abstracts, Inc.
W74-05365

STOMATAL RESPONSES TO CHANGES IN TEMPERATURE AT INCREASING WATER STRESS,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
E. D. Schulze, O. L. Lange, L. Kappen, U. Buschbom, and M. Evenari.
Planta (Berl), Vol 110, No 1, p 29-42, 1973, Illus.
Identifiers: Artemisia-herba-alba, Hammada-scoparia, Humidity, *Israel(Negev), Prunus-armeniaca, Reaumuria-negevensis, *Stomatal response, *Temperature, Water stress, Zygophyllum-dumosum, Transpiration(Plants).

The response of stomata to a gradual increase in temperature at increasing plant water stress was studied in a hot desert habitat (Negev, Israel) in the field, but under controlled temperature and humidity conditions. Four native species (Zygophyllum dumosum, Artemisia herba-alba, Hammada scoparia, Reaumuria negevensis) and 1 cultivated plant (Prunus armeniaca) were used in these studies. The stomatal response to temperature was compared with the response in well-irrigated plants of the same species. At low water stress, the diffusion resistance for water vapor decreased in response to a gradual increase in temperature. Transpiration increased accordingly. This response was reversible. All species responded in the same way. The opening of stomata with increasing temperature was apparently independent of the stomatal response regulated by atmosphere humidity. At high plant water stress, the stomatal response was reversed, i.e., the stomata closed when temperature was gradually increased. This stomatal closure was also independent of the closure regulated by atmospheric humidity. The plant water potential at which the stomatal response to temperature was reversed differed among the species investigated.--Copyright 1973, Biological Abstracts, Inc.
W74-05366

CONTRIBUTION TO KNOWLEDGE OF MAYFLIES OF THE AMUR BASIN: I. IMAGINES (EPHEMEROPTERA:EPHEMERELLIDAE), (IN RUSSIAN),
O. Ya. Baikova.
Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 77. p 178-206. 1972.
Identifiers: *Ephemerella, Ephemerellidae, Ephemeroptera, Imagines, *Mayflies, *USSR(Amur basin), *Insects, Invertebrates.

For the first time a description is presented of the imaginal forms of 4 spp. of the genus Ephemerella previously known only on the basis of larvae; supplements to the descriptions of imagines are given for other species. The data on the relationship of the segments of the tarsus, tibia and femur of mayflies of the investigated genus and quantitative indices characterizing the size and weight of winged individuals are presented. Information on some aspects of the biology of the species is given. (See also W74-05381)--Copyright 1973, Biological Abstracts, Inc.
W74-05380

CONTRIBUTION TO KNOWLEDGE OF MAYFLIES (EPHEMEROPTERA) OF THE AMUR BASIN: II. IMAGINES (RHITHROGENA, HEPTAGENIA), (IN RUSSIAN),
Izv Tikhokean Nauchno-Issled Inst Rybn Khoz Okeanogr. 77. p 207-232. 1972.
Identifiers: Ephemeroptera, *Heptagenia, Heptagenia-Arsenjevi, Heptagenia-Chinensis, Heptagenia-Flava, Heptagenia-Soldatovi, Imagines, *Mayflies, Rhithrogena, Rhithrogena-Imanica, Rhithrogena-Unicolor, *USSR(Amur basin), *Insects, Invertebrates.

As a result of breeding winged forms from larvae of Rhithrogena un--olor the identity of this species with R. lepnevae was established. The female imagines of R. lepnevae are described for the first time. A description of R. imanica (Ussuri basin) is given. A determinative table of similar species of Rhithrogena of the Asiatic part of the USSR and Eastern countries is presented. Winged forms of Heptagenia soldatovi and H. arsenjevi, previously known only by larvae, are described for the first time. However, a comparison of the morphological structures of the Polish and Lithuanian larvae and imagines of H. flava with the Amur species H. arsenjevi did not confirm a difference of these species. The species H. chinensis, described from male imagines from China, is recorded for the first time for fauna of the USSR. A description of the previously known female imagines of this species is given. The species H. tobiironis, H. yoshidae and H. kibunensis are presented for the first time for the Amur basin in a winged form. A determinative table of the imaginal stage of all species of Heptagenia is presented. (See also W74-05380)==Copyright 1973, Biological Abstracts, Inc.
W74-05381

2J. Erosion and Sedimentation

ACKER LAKE LANDSLIDE, MONROE COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
D. M. Keady, E. E. Russell, and T. J. Laswell.
Available from the National Technical Information Service as PB-228 697 $4.25 in paper copy, $1.45 in microfiche. Information Series MGS-73-1, 1973. 22 p, 13 fig, 11 ref. OWRR A-058-MISS(2).

Descriptors: *Landslides, *Mass wasting, *Mississippi, Joints(Geologic), Fractures(Geologic), Permeability, Stream erosion, Loess, Clays, *Erosion.
Identifiers: *Tombigbee River(Miss.), *Acker Lake(Miss.).

Mass wasting in the Tombigbee Sand Member of the Eutaw Formation (Upper Cretaceous) is a common occurrence on steep bluffs in northeastern Mississippi. The most recent documented slide occurred on Monday, April 27, 1970, in the vicinity of the small manmade Acker Lake, approximately five miles north of Aberdeen. The 1970 Acker Lake landslide was not the result of a single factor, but was influenced by several variables. Bluffs along the western valley wall of the Tombigbee River are kept steep in the area of Acker Lake principally by the fact that the present channel of the river is against the west valley wall in the immediate area. Acker Lake furnishes a continuing supply of water thus maintaining a high moisture content, with accompanying weight increase in permeable beds. This high moisture content probably increases pore pressure and decreases shearing strength in the sands. Heavy rainfall during March and April of 1970 brought an increase in stream energy thus enabling the Tombigbee River to remove material from the base of slides formed at an earlier period. A continuous clay bed at depth provided a surface along which initial lateral movement could occur. Joints in

Tombigbee Sand, prominent along the bluff face, probably provided passageway for more rapid movement of water than would have otherwise occurred. The conditions that led to the 1970 slide are essentially unchanged, therefore continued sliding of this type is likely. (Knapp-USGS)
W74-04862

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
Available from NTIS, Springfield, Va. 22151, PB-221 081 for $3.00 printed copy; $1.45 microfiche. Water Resources Council Report US-WRC-0100-71, Prepared by National Oceanic and Atmospheric Administration, October 1971. 245 p.

Descriptors: *Sedimentation, *Research and development, Federal government, Sediment transport, Projects, Research facilities.

A digest is presented of information furnished by all Federal agencies conducting sedimentation investigations on work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent information. The material has been organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and other foreign countries. Other major headings include laboratory and other research activities. Long-term water quality sites at which sediment data have been collected are listed. (Knapp-USGS)
W74-04916

HYDROLOGIC CHARACTERISTICS OF ALDER CREEK, IRON COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4A.
W74-04920

CERC BULLETIN AND SUMMARY REPORT OF RESEARCH PROGRESS FOR FISCAL YEARS 1965-66.
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-04926

SOME MODERN APPROACHES TO BEACH STUDIES,
Woods Hole Oceanographic Institution, Mass.
J. M. Zeigler.
Oceanography and Marine Biology, Annual Review, H. Barnes (Editor), Vol 2, p 77-95, 1964. 3 fig, 3 tab, 60 ref.

Descriptors: Coasts, *Beaches, *Waves(Water), *Sediment transport, Geography, *Currents(Water), Reviews, Equations, Rip currents.
Identifiers: *Wind generated waves, *Longshore currents, *Tidal currents, Solitary waves, Nearshore.

Following a historical approach to beach studies, various physical concepts in the study of beach processes are examined. Modern observations are discussed in terms of water movements. Equations which relate to water movement or qualitative expressions concerning the behavior of water become part of the problem under study, and measurement of the variables in these equations forms the basis for most modern field experiments. Also discussed are concepts concerned with the transport of material. The importance of treating the variables synoptically and, in the field, geographically as well is emphasized. (Sinha - OEIS)
W74-04930

LITTORAL PROCESSES - QUANTITATIVE TREATMENT,10B. LE MEHAUTE.
In: Encyclopedia of Geomorphology. R. W. Fairbridge, Reinhold, p 667-672, 1968. 6 fig, 20 ref.

Descriptors: *Beaches, Geomorphology, *Littoral, Sand spits, Sand bars, *Waves(Water), Rip currents, Coasts, *Currents(Water), Winds.
Identifiers: Longshore transport, Longshore currents, Tombolos, Baymouth bars, Barrier beaches, Mass transport, Nearshore processes.

The origin of beaches and coastal material is described. Two-dimensional wave motion affecting beaches, and waves at an angle and currents affecting beaches are discussed. Illustrations show vertical distribution of mass transport with depth and wind effects noted, longshore transport, rip currents and typical singularities in littoral physiography. The singularities are identified as spits, baymouth bars, barrier beaches and tombolos. (Sinha-OEIS)
W74-04931

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W74-04932

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04934

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
For primary bibliographic entry see Field 8B.
W74-04936

PRECISE CONTROL OF WAVE RUN-UP IN BEACH RIDGE CONSTRUCTION,
Florida State Univ., Tallahassee. Dept. of Geology.
W. F. Tanner, and F. W. Stapor.
Zeitschrift fuer Geomorphologie N. F., Vol 16, No 4, p 393-399, December 1972. 1 fig, 6 ref, 1 photo.

Descriptors: *Beaches, Slopes, Sands, Berms, Sediments, Tides, Waves(Water).
Identifiers: *Wave energy, *Beach ridges, Washover, Tidal range, *Wave run-up, Swash zone.

Beach ridge growth is essentially the work of wave run-up in the swash zone, with little or no washover effects. An approximate method is provided whereby wave height can be estimated from beach ridges. Under given sediment supply and wave conditions, run-up distance and beach face slope are rigidly related. This relationship is such that, with constant wave energy and no tidal change, the waves reach the top of the beach, neither more nor less. If deposition of sand is taking place on the beach, a small berm may be deposited in the upper part of the run-up range. Under constant conditions of deposition, this berm will grow upward and seaward into a beach ridge, having almost all of its internal bedding dipping toward the sea. Highly energetic waves will reach the top of the ridge, but there will be little wash-over. Addition of variability of waves and tide provides only that construction take place in the upper part of the tidal range, under higher-than-average wave energy levels. Elimination of the supply of excess sand puts an end to construction. (Sinha-OEIS)
W74-04939

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04941

SOME THREE-DIMENSIONAL EFFECTS IN SURF,
Brown Univ., Providence, R.I. Div. of Applied Mathematics.
R. B. Turner, and R. E. Meyer.
Available from NTIS as AD-605 662 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 6, August 1964. 16 p, 1 fig, 4 ref. Nonr 562(34).

Descriptors: *Surf, *Water(Waves), *Shallow water, *Beaches, Equations.

Asymptotic equations are presented of surf on shallow beaches with a geometry causing longshore variations in the water motion. In general, such surf is found to be governed by the three-dimensional, nonlinear shallow-water equations. However, when the seabed profile parallel to shore is shallower than the profile normal to shore, the asymptotic equations are shown to differ only in minor respects from those of two-dimensional surf. Such 'weakly three-dimensional' surf can be analysed directly in terms of the results of the two-dimensional theory. (Sinha-OEIS)
W74-04942

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2E.
W74-04943

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. B. Gilhousen.
Technical Memorandum NWS ER-55, November 1973. 11 p, 3 fig, 1 tab, 5 ref.

Descriptors: *Beach erosion, Oceanography, Meteorology, *Littoral drift, *Sediment transport, Sands, Atmospheric pressure, Fetch, Tides, New York, New Jersey.
Identifiers: Long Island(NY), *Wind-driven currents, *Longshore currents.

Oceanographic and meteorological factors involved in beach erosion can be isolated. Surface wind and pressure conditions associated with known beach erosion cases have been presented, and products operationally available to assist in predicting these conditions have been itemized. It is not known how often beach erosion does not occur when the wind and pressure conditions are favorable. Shifting sands, which continuously change near the coastal underwater topography, and tide conditions play an important role in controlling the beach erosion process. While hurricanes and tropical storms do cause major damage along the beaches, they are not considered in this study. The most damaging beach erosion is caused by a fetch directed along the coastline with an onshore component. The wind-driven steep waves stir up the sand and fine gravel and tend to eat away at the beaches. Then a longshore current, or 'littoral drift' is required to transport the loosened sand, if the erosion process is to continue. High tides, that are necessary for the erosion process to penetrate inland above the normal beach line, can be due to storm surges, lessening atmospheric pressure on the adjacent ocean surface, or the direction of the longshore current, in addition to the normal astronomical tides. (Sinha-OEIS)
W74-04945

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 8B.
W74-04948

COASTAL MOVABLE BED SCALE MODEL TECHNOLOGY,
Tetra Tech, Inc., Pasadena, Calif.
L-N. Fan, and B. Le Mehaute.
Final Report Tetra Tech No TC-131, prepared for Army Coastal Engineering Research Center, June 1969. 122 p, 20 fig, 9 tab, 68 ref, 2 append. DACW72-68-C-0020.

Descriptors: *Sediment transport, *Coasts, *Waves(Water), *Model studies, Coasts, Data processing.
Identifiers: Littoral transport, Similitude relationships, Scale effects.

The historical development, applications, limitations and basic requirements of coastal movable bed model technology are reviewed. Similitude relationships are established based upon important parameters governing coastal sediment transport. Relationships proposed by previous investigators are critically reviewed. Four basic scale ratios, namely, horizontal scale, vertical scale (or distortion), sediment size and specific weight can be determined from established similitude relationships. Possible scale effects are analyzed. A standard procedure is recommended. This procedure includes data acquisition, data correlation, choice of scales and artificial sediments, preliminary wave tank experiments, adjustment of the model, determination of time scale of bed evolution, interpretation of results and scale effects. A formula is suggested for estimating the time scale of bed evolution due to littoral transport by waves. These results should be useful in both evaluating and utilizing the movable bed model as a tool in coastal engineering problems. (Sinha-OEIS)
W74-04949

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04951

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04955

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
R. L. Miller, and J. M. Zeigler.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 7, p 103-122, 1964. 9 fig, 27 ref.

Descriptors: *Waves(Water), *Tidal effects, Shores, Coasts, *Shallow water, Shoals, *Sediment transport.
Identifiers: *Breaking waves, *Shoaling, Nearshore processes, Velocity field patterns, Breakers.

The results presented are the first detailed measurements of the horizontal velocity component inside breaking waves. The field study was originally undertaken in 1960 to determine the presence and strength of mid-depthreturn flow under shoaling waves. In the course of the experiment, a series of measurements was made very close to the shore. During one tidal cycle, the instruments became exposed to breakers, and continued to operate. A study of the resulting data showed that detailed velocity measurements could be made within the natural breaker in the field. Accordingly, a series of runs was made and velocity data collected on breakers ranging from very small to storm size. The results very strongly suggest that different breaker shapes have different internal velocity fields. It is possible that the initiation of instability and the subsequent development of the breaker may be characterized by one or several vortex systems, as suggested by the velocity field patterns. The breakers studied were of the type that break directly on the shore and include within the sequence , the runup and backwash from the foreshore. (Sinha - OEIS)
W74-04960

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04962

SEASONAL CHANGES IN BEACHES OF THE NORTH ATLANTIC COAST OF THE UNITED STATES,
Army Coastal Engineering Research Center, Washington, D. C.
J. M. Darling.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 15, p 236-248, 1964. 8 fig, 5 tab, 4 ref.

Descriptors: *Beach erosion, *Seasonal, Erosion, Deposition(Sediments), *Tides, New Jersey, New York, Rhode Island, *Waves(Water), Coasts, Storms.
Identifiers: Nearshore processes, Wave period, Wave steepness.

Seasonal changes of eight Atlantic Ocean beaches along the East Coast of the United States from southern New Jersey to Rhode Island have been under study since September 1962. Changes in the beach profiles to date indicate variations on a seasonal basis. Analysis of surveys made at Atlantic City covering a period of little more than one year, indicate marked seasonal differences in beach conditions. The waves during the erosion periods were characteristically of greater steepness than those of the accretion period. The seasonal trend inferred from data for Atlantic City seems to prevail in varying degrees at all the beaches under study, with the possible exception of those fronting on Long Island Sound rather than the Atlantic Ocean. It must be recognized that the actual erosion or accretion does not occur as a continuous pattern, but there are periods which are dominated either by erosion or accretion. These seasonal trends are then the net or resultant behavior pattern. (Sinha - OEIS)
W74-04963

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04964

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
J. Castanho.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 17, p 259-266, 1964. 3 fig, 1 ref.

Descriptors: Bores, *Waves(Water), *Littoral drift, *Sediment transport, Coasts, Energy.
Identifiers: *Wave energy, *Breaking waves.

In this discussion of wave energy and littoral transport, the following aspects are considered: energy dissipated by friction losses; energy contained in the longshore current; and energy dissipated by breaking waves. The momentum method is used in calculating the mean velocity of the longshore current. Energy fractions dissipated in friction losses, breaking losses and solid discharge are also calculated. (Sinha - OEIS)
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
P. Bruun, and J. Purpura.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 18, p 267-288, 1964. 11 fig, 2 tab, 25 ref.

Descriptors: *Florida, *Littoral drift, *Sediment transport, Shear stress, Bed load, *Waves(Water), *Currents(Water).

A combined field and laboratory research program is underway to gain quantitative information on littoral drift longshore as well as perpendicular to the shore. The laboratory utilizes modern tracing techniques by luminophores including a scanning (counting of grains) machine and experiments in a wave tank where a current is passed through waters agitated by waves propagating parallel to or perpendicular to the current action. Modes of sediment transport examined are sheet layer movement and transverse movement. In the laboratory, studies have been made on transport by wave action, transport by wave and flow action (propagation unidirectional), and wave and current action operating under an angle with each other. (Sinha - OEIS)
W74-04966

SAND LOSSES FROM A COAST BY WIND ACTION,
California Univ., Berkeley. Coll. of Engineering.
J. W. Johnson, and A. A. Kadib.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 24, p 368-377, 1964. 3 fig, 6 tab, 6 ref.

Descriptors: *California, *Sediment transport, *Wind erosion, *Dunes, *Sands, Equations, *Beach erosion.

A procedure is outlined for the calculation of the annual rate of transport of sand that might be expected to be carried inland from a natural beach by wind action. The procedure involves the beach composition and alinement, the frequency of winds of various speeds from various directions, and a suitable formula to describe the transport. It is possible that the transport formula may be altered as a result of current research; however, the general procedure as outlined should apply. (Sinha - OEIS)
W74-04967

RESIDENCE TIME OF SAND COMPOSING THE BEACHES AND BARS OF OUTER CAPE COD,
Woods Hole Oceanographic Institution, Mass.
J. M. Zeigler, S. D. Tuttle, G. S. Giese, and H. J. Tasha.

In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 26, p 403-446, 1964. 6 fig, 3 tab, 8 ref.

Descriptors: *Sediment transport, *Beaches, *Sand bars, *Erosion, Deposition(Sediments), *Massachusetts.
Identifiers: *Cape Cod(Mass), Residence time.

Residence time is defined as the average number of years a grain of eroded sediment is likely to spend in a specific area before it is transported elsewhere. Sediment seems to take a preferred path, some of it moving along the beach and some along the bars. The time scale is limited to the past seventy years, the time for which data were available. The geographical position is limited to a strip of the east coast of Cape Cod extending seaward to where water depth is about forty feet. The method used to compute residence time involves volume stability. In as much as there is neither gain nor loss of the average volume of sand built features, sand must be moving out of the study area at the same rate it is being introduced. Therefore, the residence time in years is the average volume of a beach or bar divided by the yearly volume of sediment added by erosion to the beach or bar. The east coast of Cape Cod is uniquely situated for a study such as this because sediment is introduced into the definition area only by erosion within the area of the cliffs or sea floor. No sediment or very little of it is introduced into the study area by means of littoral drift. (Sinha - OEIS)
W74-04968

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D. C.
C. L. Bretschneider.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 41, p 617-659, 1964. 28 fig, 1 tab, 31 ref.

Descriptors: *Storms, *Winds, *Waves(Water), *Tides, Coasts, Calibrations, *Storm surges, *Beaches, Dunes, Data.
Identifiers: Hindcasts, Gusts.

The material presented represents a hindcast of events during the March 6-8, 1962, storm along the east coast of the United States. Specifically the hindcasts include (1) deep water waves, waves over the continental shelf, waves in shallow water, and waves at the coastline; (2) total tide, including normal predicted tide, storm surge and wave setup; (3) wave run-up on the beach and an estimation of beach berm and dune erosion; (4) wind speeds over water, over the beach, and over the top of the dunes. The hindcasts were checked with available data for the storm. Numerous sources of information on the storm were available to improve the accuracy of the 'state of the art' in forecasting. The so-called 'calibrated methods' for hindcasting were quite suitable for the present storm conditions. (Sinha - OEIS)
W74-04969

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

MOVEMENT OF WATER ALONG THE SHORE AND NORMAL TO IT IN THE NEAR-SHORE ZONE OF A SHALLOW-WATER COAST,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2L.
W74-05028

COMPOSITE ENERGY FLUXES AS FACTORS IN COASTAL FORMATION,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 2L.
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
S. H. Hopkins.
Available from NTIS as AD-767 562, price $8.25 in paper copy, microfiche $1.45. Army Engineer Waterways Experiment Station, Contract Report H-73-2, August 1973. 411 p. DACW39-72-C-0002, DACW73-69-C-0043, DACW73-70-C-0004.

Descriptors: Salt marshes, Coastal marshes, Aquatic habitats, Marsh plants, Marshes, Environment, *Estuaries, *Aquatic animals, *Bibliographies, *Salinity, Coasts, *Biology, *Ecology, *Aquaculture, *Aquatic plants.

Abstracts are given for some 1429 published and unpublished reports dated 1972 and earlier, on physiological and ecological effects of salinity, salinity differences, and changes in salinity on organisms living in estuaries and other coastal waters. Author and subject indexes are included. Authors are listed alphabetically and each author's works are listed chronologically. The subject index provides for cross-indexing by subject. (Sinha - OEIS)
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
F. J. Schwartz, and A. F. Chestnut.
Available from NTIS as COM73-11408, price $4.50 in paper copy, microfiche $1.45. Sea Grant Publication UNC-SG-73-12, June 1973. 132 p, 43 fig, 83 tab, 8 ref. SG-04-3-158-40.

Descriptors: North Carolina, *Estuaries, *Water temperature, *Salinity, Sounds, Isotherms, Hydrography.
Identifiers: Isohalines, Atlases.

An atlas of figures, tables, and short text presents water temperature and salinity data for all North Carolina estuarine and sound coastal waters from Virginia to South Carolina except Currituck Sound. Monthly surface and bottom isohalines and isotherms are illustrated. Tables list actual raw determinations for these parameters. (Sinha - OEIS)
W74-05032

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Available from NTIS as COM73-11045, price $3.00 in paper copy, microfiche $1.45. Marine Technical Report No 4, (A Coastal Management Publication), 1974. 114 p, 17 fig. NOAA Grant.

Descriptors: Rhode Island, *Barrier islands, Coasts, *Beaches, *Management, *Land use, Conservation, Land development, *Community development.

The report is designed to supplement Rhode Island's Barrier Beaches: Volume I - A Report on a Management Problem and an Evaluation of Options. Both documents are elements in a study prepared for the State Coastal Resources Management Council by the University of Rhode Island's Coastal Resources Center. Individual beaches are examined on a community-by-community basis. A consolidated Table of Contents for Volume I and II is included. A location map identifies the barrier beach areas which were studied. Land use and natural feature maps were completed for all barrier beaches and a number of these appear in this volume. (Sinha - OEIS)
W74-05033

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-05034

EXPERIMENTAL STUDIES OF BEACH SCOUR DUE TO WAVE ACTION,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. O. Song, and R. E. Schiller.
Available from NTIS as COM73-11745, $4.25 in paper copy. Sea Grant Publication TAMU-SG-73-211, Coastal, Hydraulic, and Ocean Engineering Group Report No. 166 C.O.E., July 1973. 96 p, 31 fig, 2 tab, 40 ref, 4 append. NOAA SG 2-35213, 04-3-158-18.

Descriptors: Coasts, *Beaches, *Scour, Regression analyses, *Waves(Water), *Shallow water, *Sea walls.
Identifiers: Seawall beaches, Standing waves, Beach scour, Wave action.

The processes were investigated involved in the formation of beach scour, caused by wave action, on a natural beach and a seawall beach. Studies also took into account the determination of the reflection coefficient which characterized the wave reflected from both the seawall and the deformed beach profile. The standing wave, formed by the reflection of the waves, was found to be important in the analysis of beach scour phenomena. For the calculation of the reflection coefficient, two methods were used: the envelope method and the Coastal Engineering Research Center (CERC) method. The results showed excellent agreement. The linear standing wave theory was compared with the second order standing wave theory. The wave surface profile and the corresponding horizontal and vertical velocity components of the water particles at the designated points on the free water surface were calculated on the basis of the two theories. The results indicate that the linear standing wave theory gives good results as a first approximation.

To predict the scour depth on the natural beach and the seawall beach, regression analyses were performed. The results gave excellent correlation. (Sinha - OEIS)
W74-05035

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
C. G. Lange.
Available from NTIS as AD-768 197, price $3.00 in paper copy, microfiche $1.45. Report, 1970. 32 p, 8 ref. ONR Contract N000-14-69-A-0200-4022.

Descriptors: *Waves(Water), Energy, *Stochastic processes, Mathematical studies, Statistics, *Gravity waves, Equations.
Identifiers: Wave propagation, Bottom topography, Random media.

The way in which small random inhomogeneities in a transmission medium affect the statistical properties of a system of waves was studied. Provided the spectral cumulants are sufficiently smooth at some initial time, a sequence of closures for the zeroth order spectral functions can be deduced which describe asymptotically the transfer of energy between wave numbers. Of particular importance is the fact that the closure equations are derived without the need to resort to ad hoc statistical assumptions. The general theory is applied to the problem of the propagation of water waves over an irregular bottom topography. (Sinha - OEIS)
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
R. A. Linthurst, and R. J. Reimold.
Available from NTIS as COM73-11452, price $3.50 paper copy, microfiche $1.45. Sea Grant Publication, Technical Report Series No 73-4, June 1973. 41 p, 34 ref, 7 append, 4 infold maps. NOAA.

Descriptors: Resources, Georgia, *Aerial photography, Coasts, Shallow water, Surveys, Satellites(Artificial), Photogrammetry.
Identifiers: Gemini, Apollo.

The available store of photographic information of the Georgia coast including acquisition, interpretation, and utilization of aerial photography is summarized. Information is given on photogrammetric equipment, photographic systems, aeronautical sectional charts and topographic maps, tidal data, and coastal protection agencies. (Sinha - OEIS)
W74-05042

SEDIMENTARY PROCESSES ON THE CONTINENTAL SLOPE OFF NEW ENGLAND,
Woods Hole Oceanographic Institution, Mass.
J. C. MacIlvaine.
NTIS as AD-768 284, $5.50 in paper copy. Technical Report No. WHOI-73-58, September 1973. 211 p, 51 fig, 4 tab, 64 ref. ONR Contract N00014-66-C0241.

Descriptors: New England, Massachusetts, *Sedimentation, *Continental slope, *Sediment transport, Geomorphology, *Turbidity currents, Creep, Hydrodynamics, Biology.
Identifiers: Cape Cod(Mass), Bottom currents, Quaternary, Oceanographic data, Gravitational processes, Slumping.

A small area of the continental slope south of Cape Cod, Massachusetts was studied. Gravitational processes (slumping, creep, and turbidity currents) are apparently the most effective erosional processes. Massive large-scale failure occurs where the slope steepens from a gradient of 1.5 deg to 7.6 deg, producing scarps hundreds of meters in relief. Smaller scale slumping occurs on the other parts of the continental slope. Material removed by slumping is emplaced at the foot of the continental slope as intact and disrupted blocks 1 to 100 m thick. Turbidity currents generated by slumping have apparently eroded V-shaped gullies in the lower continental slope. Bottom currents are most influential at the shelf break, where they produce sorting of surface sediments and suspension of fine material by erosion of the bottom. Laboratory flume experiments and observations of the bottom indicate that the sediments of most of the continental slope are not normally affected by bottom currents. Biological activity causes both roughening and smoothing of the sediment surface. Tracking of the bottom produces small-scale roughness, and reworking of the bottom reduces larger roughness elements. Biological production of fibrous structures help render the the sediment surface extremely resistant to erosion by bottom currents. (Sinha - OEIS)
W74-05043

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
A. N. Balci.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 42-45, 1972.
Identifiers: Clay, Gravel, *Organic matter, *Slope erosion, Soils, *Turkey(Anatolia), *Soil erosion.

The soils developed from 4 different parent materials in the study area were highly erodible. Parent material has strong influence on soil properties related to erodibility. Dispersion ratio as an index of erodibility and various other soil properties in relation to 4 different parent materials were found to be significantly different. The relative differences in inherent potential erodibility of soils developed from various parent materials may be ranked on the basis of dispersion ratio as follows: Neocene silt greater than Sandstone greater than Andesite greater than Conglomerate. The soils developed on southern slopes were found to be significantly more erodible than those on northern slopes. The relatively better soil stability on northern slopes may be attributed to the significantly higher contents of organic matter and clay fraction. Organic matter contents of surface soil layers (0-15 cm) were found to be significantly higher than those of subsurface (15-30 cm) soil layers. This relation was reserved for gravel content and particle density. Organic matter, gravel, and clay contents of soils showed highly significant inverse associations with dispersion ratio whereas electrical conductivity and silt content indicated significant positive correlation with the erodibility. Several useful relations were found between dispersion ratio and various other soil properties and the results are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-05066

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
R. G. Shepherd, and S. A. Schumm.
Geological Society of American Bulletin, Vol 85, No 2, p 257-268, February 1974. 20 fig, 3 tab, 29 ref. NSF Grant GA-27726.

Descriptors: *Erosion, *Stream erosion, *Channel erosion, Hydraulic models, Scour, Channel morphology, Flumes.
Identifiers: River incision.

River incision was studied in simulated bedrock, a mixture of sand and kaolinite. Slope, sediment feed, and water discharge were controlled during the development of four channels. After an increase of slope at constant discharge, the following sequence of erosion occurred: (1) development of longitudinal lineations, ripples, and potholes; (2) enlargement of the lineations into prominent grooves; (3) coalescence of the grooves into a single, narrow, and deep inner channel. The inner channel was incised below base level and a sequence of bedrock lows and highs formed. Bedrock scour lows had a weakly regular spacing during incision and a randomly clustered spacing following aggradation. Incision around stabilized alternate bars in a sinuous sand-bed channel resulted in destruction of the bars and maximum scour where the flow was locally constricted. In an initially sinuous bedrock channel, scour depth was greater at bends than at crossings. Provided all of the available sediment load was entrained, the bed was eroded more at convex banks of bends than at concave banks. However, after deposition occurred, the maximum erosion shifted to the concave bank. These results indicate that lateral or vertical incision at bends of incised meandering streams is controlled by the amount of available sediment load entrained by channel-forming discharges. Incised meanders superposed from an earlier pattern on a peneplain should rarely occur in nature, if epeirogenic tilting caused the incision. (Knapp-USGS)
W74-05134

WHAT FUTURE FOR NIAGARA FALLS,
Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
S. S. Philbrick.
Geological Society of American Bulletin, Vol 85, No 1, p 91-98, January 1974. 2 fig, 18 ref, append.

Descriptors: *Erosion, *Waterfalls, *New York, Gradients(Streams), Stream erosion, Geomorphology, Thalweg.
Identifiers: *Niagara River, *Niagara Falls.

The future recession of Niagara Falls up the thalweg of Niagara River is described. The fastest rate of recession occurs in the notched configuration when rock bursts result from high stresses in the rock, as they did several times during the nineteenth century. Conversely, the slowest rate of erosion is during the stable arch configuration such as has prevailed during the first three quarters of the twentieth century. Upstream migration of the Horseshoe Falls will lower the level of the Chippawa-Grass Island Pool below the bottom of the American Channel and unwater the American Falls. The level of Lake Erie may be lowered a few feet at this time. Because the top of the Lockport Formation dips beneath the surface and the Salina rocks appear, the upper part of the valley will cease to be a dolomite cliff and will become a much flatter-sloped outcrop of the less resistant Salina rocks. As the falls recede upstream, the continued upstream dip of the strata will lower the base of the Salina and increase the height of the Sa˝a exposure to produce a distinctly broader, flatter gorge quite different in appearance from the Lockport Gorge. The Final Falls will be much lower than the preceding Horseshoes and may be so slow in recession as to be a quasi-stationary falls, without immediate change in the level of Lake Erie. (Knapp-USGS)
W74-05135

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2G.
W74-05136

RHODE ISLAND'S BARRIER BEACHES: VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2L.
W74-05152

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W74-05191

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal.
Samaru Res Bull. 141, p 163-173. 1972.
Identifiers: Cultivation, *Nigeria(Samaru), Ridges, Runoff, *Soil conservation, *Storms(Severe), Corn(Field), *Erosion control.

An exceptionally heavy storm over the Samaru catchment basin was unevenly distributed. Rainfall ranged from about 6 to 2 inches over a distance of several miles. The peak intensity of the storm reached 11.4 inches/hr with intensities of between 4.7 and 8.5 inches/hour maintained for 25 min. The average rainfall received by the catchment basin was 2.8 inches of which 44% was accepted causing a rise in the water-table of about 14 inches. The remaining 1.6 inches were lost in run-off, about 80% of which drained in 12 hr. A cultivated bench terrace on a uniform slope of 1:320, 200 yards long and with a catchment area of about 0.3 acre, supporting maize on 3-foot ridges gave the highest run-off (57%), while from terraces planted with maize without ridges under similar conditions of slope and catchment area the run-off rate was only 29% to 44% of the rainfall. Soil conservation measures at Samaru farm were effective in rapidly removing a high volume of run-off and in preventing flooding without damage to the main watercourses. The storm considerably reduced the size of ridges often undermining the plant support and causing lodging of certain crops. On the few non-ridged terraces, no excessive erosion was observed and there was no lodging of crops. The safe spacing of graded terraces against rill erosion was tentatively assessed to be an interval of 180 ft at 1.4% slope. The merits of ridges and flat cultivation with and without effective soil conservation measures are discussed. With adequate soil conservation such as that afforded by graded or bench terraces, flat cultivation has many advantages over ridging under mechanized farming.--Copyright 1973, Biological Abstracts, Inc.
W74-05340

PREDICTION OF THE START OF EROSION IN THE LIGHT OF PRINCIPLES OF RELIABILITY THEORY, (IN RUSSIAN),
Ts. E. Mirtskhulava.
Dokl Adad S-Kh Nauk. 12, p 39-41. 1972.
Identifiers: *Erosion, *Model studies, *Prediction, River, Silt, Suspension, *Reliability theory.

The method proposed for predicting the start of erosion with the use of the principles of reliability is imperfect, but it led to the construction of a sufficiently simple model for estimating this important stage of erosion. The value of the study consists not so much in results obtained as in the proof of the possibilities opened by the principles of reliability theory for solving many analogous problems governed by stochastic parameters and overshoots of random functions (suspension, deposition and transport of silt, deformations of river beds, etc.).--Copyright 1973, Biological Abstracts, Inc.
W74-05347

RESULTS OF A SECOND STUDY OF WIND-ERODED SOILS IN THE PAVLODAR PRIIRTYSHYE (IN RUSSIAN),
E. D. Kuzmina.
Biol Nauki, Vol 15, No 10, p 117-121, 1972.
Identifiers: Clays, Sand, Silt, Soils, USSR, Winds, *Soil erosion, *Erosion control, *USSR(Pavlodar Priirtyshye), *Soil treatment.

Results from a 5-yr follow up experiment showed a 10-fold decrease in soil erosion due to application of certain soil protection measures--the increase of sand and clay and the decrease of small or fine sand and coarse silt. Other important factors responsible for controlling erosion were an increase in humus, moisture and annual cultivation of the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05369

2K. Chemical Processes

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
For primary bibliographic entry see Field 5A.
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
For primary bibliographic entry see Field 5A.
W74-04870

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-04947

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
Ye. V. Petrakov, E. V. Kozlova, and N. A. Sargsyants.
Vestnik Leningradskogo Universiteta, No 12, Geologiya-Geografiya, No 2, p 74-77, June 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Water quality, *Fluorides, *Groundwater, Groundwater basins, Aquifers, Artesian aquifers, Rocks, Geologic time, Inorganic compounds, Salts, Alkaline water, Water temperature, Hydrogen ion concentration, Oxidation-reduction potential, Curves.
Identifiers: *USSR(Moldavia), Mineralization.

Fluoride concentrations in alkaline waters of the Moldavian artesian basin are extremely high, reaching 20 mg/liter in waters of Riphean-Eocambrian rocks and 13.5 mg/liter in waters of Silurian, Cretaceous, and Lower Sarmatian rocks. On the basis of its high rate of migration in alkaline waters of the basin, fluoride belongs to the category of very mobile and readily mobile elements. A relation is established between groundwater mineralization and fluoride content. Maximum fluoride concentrations correspond to a mineralization of 2-5 g/liter for waters of sedimentary rocks and 1-2 g/liter for waters of metamorphic rocks. With a further increase in mineralization, the amount of fluoride in groundwater decreases sharply. The chemical composition of groundwater has a positive effect on the leaching of fluoride from rocks and on fluoride migration. An increase in Na2CO3 and NaHCO3 concentrations results in a higher fluoride content in groundwater and intensifies fluoride migration; an increase in CaCO3 content retards fluoride migration. A change in pH, Eh, and water temperature has little effect on the fluoride concentration in groundwater of the Moldavian artesian basin. (Josefson-USGS)
W74-05016

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
For primary bibliographic entry see Field 2B.
W74-05130

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
For primary bibliographic entry see Field 2F.
W74-05132

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

GENERAL REPORT ON DEVELOPMENT AND UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
For primary bibliographic entry see Field 3C.
W74-05218

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
For primary bibliographic entry see Field 5A.
W74-05240

FIELD IONIZATION MASS SPECTROMETRY: A NEW TOOL FOR THE ANALYTICAL CHEMIST,
Stanford Research Inst., Menlo Park. Calif.
For primary bibliographic entry see Field 5A.
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, and A. Y. W. Ho.
Analytical Chemistry, Vol 46, No 1, p 9-11, January 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Volumetric analysis, *Aqueous solutions, *Automation, Methodology, Monitoring, Flow rates, Sulfides, Ions, Automatic control, Chemical analysis, Pollutant identification.
Identifiers: *Ion selective electrodes, *Continuous monitoring, *Gradient titration, Reagents, Sulfied electrodes, Membrane electrodes, Accurary, Endpoint sensors.

A new approach to the automation of titration processes using ion-selective electrodes is described. Based on the gradient titration principle, the method involves the semicontinuous monitoring of a sample stream with a reagent stream where the concentration of the latter increases linearly in the form of a gradient. The flow rates of both sample and reagent streams are maintained constant, and a suitable ion-selective electrode monitors the approach to the equivalence point. The method is, in principle, the constant volume analog of conventional titrimetry. The results obtained for the determination of sulfide ion using mercuric nitrate as gradient reagent and a sulfide membrane electrode are presented. The initial study has shown that the gradient titration technique is experimentally feasible when an appropriate ion-selective electrode with a rapid response is available as the end-point sensor. No sophisticated potential measuring device is required; simple, inexpensive operational amplifier modules can be used for the potential readout. The procedure as described is not fully automatic, however, with part of the sample (and reagent titrant) handling step being done manually. Full automation, however, is possible by incorporating a modified Technicon Sampler into the system. (Holoman-Battelle)
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, T. H. Ryan, and M. J. D. Brand.
Analytical Chemistry, Vol 46, No 1, p 12-15, January 1974. 4 fig, 3 tab, 40 ref.

Descriptors: Effects, Calcium, Cations, Selectivity, Lead, Magnesium, Strontium, Zinc, Cadmium, Copper, Sodium, Hydrogen, *Electrodes.
Identifiers: *Liquid membrane electrodes, *Calcium electrodes, *Ionic interference, Response time, Data interpretation, Ion selective electrodes, Ion activity, Barium.

Measurements on the response time of a Calcium Selective Liquid Membrane Electrode are reported and a new parameter t sub 95 is proposed as being a more representative measure of electrode performance than the more widely used t sub 1/2. The former value is of more importance in assessing the performance of an electrode in real analytical situations. The effect of various interfering ionic species on the response time of the electrode is investigated and ions tested have been divided into three groups according to their effect on the response time. An interpretation of this division is proposed on the basis of the kinetics of the reaction of the interferent ion with the membrane site species and conventional selectivity ratios. It has been shown that a calcium liquid membrane electrode responds rapidly and reproducibly to step changes in calcium ion activity, with response time of the order of a few seconds. Also interfering ions can have a marked effect on the electrode response time and this cannot always be predicted from a knowledge of the selectivity constant. Where the selectivity constant is very small, it may be assumed that no effect on response time will be observed. For interfering ions with moderate to large selectivity constants, an increase in electrode response time will be observed when the kinetics of the interferent ion reactions become rate limiting. (Holoman-Battelle)
W74-05304

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
For primary bibliographic entry see Field 5A.
W74-05314

2L. Estuaries

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
R. H. Chabreck, and A. W. Palmisano.
Ecology, Vol 54, No 5, p 1118-1123, Late Summer 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Hurricanes, *Freshwater marshes, Aquatic plants, *Salt marshes, *Marine plants, *Environmental effects, Soil chemistry, Water chemistry, Mississippi River, Deltas, Water sampling, Marsh plants, Coastal marshes, Water analysis, Soil analysis, Brackish water, Organic matter, Alligatorweed, Floating plants, Willow trees, Water hyacinth, Vegetation, Amphibious plants, Rooted aquatic plants, Widgeon grass.
Identifiers: *Mississippi River Delta, Recovery, Macrophytes, Organic carbon, Phragmites communis, Myriophyllum spicatum, Alternanthera philoxeroides, Lemna minor, Eichhornia crassipes, Duckweed, Reed grass, Distichles spicata, Scirpus robustus, Spartina patens, Salix nigra, Balck willow, Bulrush, Species abundance, Vetch, Aster, Water hyssop, Southern swamplilly, Water pennywort, Common frog-fruit, Narrow-leaved cattail, Great duckweed, Chicken spike, Smooth cordgrass, Big cordgrass, Saltmeadow cordgrass, Goldenrod.

The active delta of the Mississippi River was sampled in August 1968 to determine plant species composition, plant coverage, and soil and water chemistry. Hurricane Camille struck this area in August 1969, with winds in excess of 200 km/h and tides ranging upward to 5.2 m above MSL. The delta was resampled 2 weeks following the hurricane to evaluate the immediate effects on vegetation, soil, and water, and again 1 year after the hurricane to determine the recovery rate of vegetation. The hurricane resulted in a drastic reduction of vegetation. Regrowth was rapid in the delta marshes and after 1 year plant coverage approached pre-hurricane levels of abundance; however, recovery was slower in ponds and lakes. The loss of vegetation was mainly a result of the sweeping action of wind and water, and plants were either uprooted or ripped apart and carried away by the current. Water salinity increased with the hurricane but declined by the following year and appeared to have only slight effect on marsh vegetation. Plant species varied in their response to the hurricane. Bacopa monnieri showed practically no effect, and Phragmites communis and Spartina alterniflora were reduced only slightly. Myriophyllum spicatum, Panicum repens, and Alternanthera philoxeroides were greatly reduced by the storm; and after 1 year, only Alternanthera philoxeroides showed significant recovery. (Holoman-Battelle)
W74-04875

CURRENTS AROUND THE HAWAIIAN ISLANDS. A STUDY OF COASTAL CURRENTS IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
For primary bibliographic entry see Field 5B.
W74-04925

CERC BULLETIN AND SUMMARY REPORT OF RESEARCH PROGRESS FOR FISCAL YEARS 1965-66.
Army Coastal Engineering Research Center, Washington, D.C.
Vol II, 1965-66. 76 p.

Descriptors: *Coastal engineering, Coasts, Beaches, *Waves(Water), *Currents(Water), *Tides, *Storms, *Florida, *North Carolina, Instrumentation, Sampling, Sediments.
Identifiers: Longshore currents, Breakers, Surf zone, Sea sleds, Wave action, Nearshore processes.

This issue contains seven articles of interest to those concerned with coastal, estuarine, and nearshore processes. These are: Effect of Wave Action on Tidal Stages Along the Coast of Florida, March 1962; Longshore Currents at Nags Head, North Carolina; Study of Pilot Beaches in New England for the Improvement of Coastal Storm Warning; The Sears Sea Sled for Surveying in the Surf Zone; Heights of Waves Generated by a Flap-Type Wave Generator; Scuba Diving to Investigate InSitu Behavior of Mobile Suspended-Sediment Sampler; and Progress Reports on Research Sponsored by the Coastal Engineering Research Center. (See W74-04927 and W74-04928) (Sinha - OEIS)
W74-04926

EFFECT OF WAVE ACTION ON TIDAL STAGES ALONG THE COAST OF FLORIDA, MARCH 1962,
Army Engineer District, Jacksonville, Fla.
M. Lazarus, and C. L. Nowlin.
In: CERC Bulletin and Summary Report of Research Progress for Fiscal Years 1965-66, Vol II, p 1-10, 1965-66. 5 fig, 2 tab, 5 ref.

Descriptors: *Florida, *Storms, Wind tides, Tidal effects, *Atmospheric pressure, Energy, *Waves(Water), Coasts, Beaches.
Identifiers: United States East Coast, Swells, Wave action, Barometric pressure, Long-period waves.

The northeast storm of 5-9 March 1962 was one of the more severe storms which have battered the east coast of the United States in recent times. It caused very severe damage from Long Island to the Outer Banks of North Carolina and significant damage from Maine to Florida. The entire Florida coastline was affected by long-period swells, although it was far from the center of the storm and the winds which generated them. Unusually high tides which could not be attributed entirely to the effect of local winds were observed during this period. Some instances are discussed of observed tidal behavior where the departures from predicted values are attributed to the effect of long-period waves. Examination of tidal data from stations distributed along the Florida coast during this storm incident shows a definite increase in tidal stage due to energy absorbed from wave action - i.e., wave effect - rather than wind set-up or barometric pressure. (See also W74-04926) (Sinha - OEIS)
W74-04927

LONGSHORE CURRENTS AT NAGS HEAD, NORTH CAROLINA,
Army Coastal Engineering Research Center, Washington, D.C. Research Div.
C. J. Galvin, Jr., and R. P. Savage.
In: CERC Bulletin and Summary Report of Research Progress for Fiscal Years 1965-66, Vol II, p 11-29, 1965-66. 7 fig, 4 tab, 7 ref.

Descriptors: *North Carolina, *Beaches, *Slopes, *Currents(Water).
Identifiers: Outer banks(NC), *Longshore currents, *Breakers, Surf zone, Velocity measurement.

Longshore current velocity and associated wave and beach conditions were measured during 5 days in March 1964, along a beach on the Outer Banks of North Carolina. Velocity measurements, obtained by repeatedly timing the travel, over a 200-foot distance, of free-floating balloons filled with fresh water, did not indicate a pulsating flow for the longshore current during the time of measurement and over the distance traveled by the floats. Breaker angle, the variable most closely correlated with current velocity, was measured by Brunton compass, by triangulation on a buoy at the breaker line, and by measurement of the velocities of the crest and plunge point of the breaking wave. Wave height and wave period were measured from wave gage records and by visual estimation. Beach slopes beneath the surf zone, measured from profiles supplied by the Louisiana State University field station at Nags Head, varied from 0.026 to 0.030. In four of the five sets of data obtained, the measured velocity (1.3 to 4.3 feet per second) differed by 0.1 and 1.0 foot per second from that predicted by two very different equations for longshore current velocity. (See also W74-04926) (Sinha - OEIS)
W74-04928

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
J. E. Overland.
In: Proceedings 18th Annual Technical Meeting, Institute of Environmental Sciences, May 1972. p 178-185 (1972). 2 fig, 2 tab, 21 ref.

Descriptors: *Simulation analysis, *Model studies, Equations, Friction, Turbulence, *Estuaries, *Water quality, Hydrodynamics, *Reviews, Path of pollutants.

Some of the current hydrodynamic and water quality estuarine models and the physical assumptions associated with them are reviewed. Technically, there is a distinction between modeling and simulating a physical system. Simulation implies correlating a large amount of data for a curve of best fit and to use this functional dependence for prognostication. Modeling implies starting from basic physical principles and deducing the behavior of more complex processes. Representation of estuaries is usually a combination of both techniques; one usually proceeds as far as possible on physical grounds, but finally fits the model to the prototype by judicious choice of unknown parameters in the equations, usually those associated with friction or turbulence. (Sinha - OEIS)
W74-04929

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman.
In: Encyclopedia of Science and Technology. McGraw-Hill Book Company, Inc., 1971. 8 p, 8 fig, 10 ref.

Descriptors: *Coasts, *Beaches, *Waves(Water), Reviews, *Sediment transport, *Currents(Water).
Identifiers: Surf zone, *Nearshore processes, Circulation cells, Biological effects, Longshore currents, Beach cusps.

The establishment and persistence of natural sand beaches are often the result of a delicate balance among a number of factors, and any changes, natural or man-made, tend to upset the equilibrium. Explanations are given on waves, currents in the surf-zone, the formation of circulation cells, beach types, beach cycles, beach cusps, the mechanics of beach formation, longshore movement of sand, and the source of beach sediments. The rigor of wave action and the continually shifting substrate make the sand beach a unique biological environment. Since the beach-forming processes and the trapping of material by currents and sand are much the same everywhere, the animals found on sand beaches throughout the world are similar in aspects and habits. (Sinha-OEIS)
W74-04932

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 5B.
W74-04933

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. D. Kulm, and J. V. Byrne.
Marine Geology, and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropo

W74-04934

SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS IN 1969 AT AGATE BEACH AND YAQUINA BAY, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
J. J. Gonor, and A. B. Thum.
Available from NTIS as AD-703 662 for $6.00 paper copy, $1.45 microfiche. Data Report No. 39, prepared for Office of Naval Research, Reference 70-1, February 1970. 24 p, 1 fig, 3 tab. N00014-67-A-0369-0001.

Descriptors: *Oregon, Coasts, *Temperature, *Salinity, *Upwelling, Tides, *Seasonal, *Estuaries.
Identifiers: Agate Beach(OR), Yaquina Bay(OR), Sea surface temperature.

Daily temperature and salinity conditions measured in the surf at Agate Beach, Oregon are summarized by 15 day periods for 1968 and 1969. For each period the number of observations, the high, the low, the mean and the standard deviation of the temperature and salinity measurements are tabulated. Daily data for 1969, derived from afternoon measurements are also given. A map indicating the stations is included, and the data are briefly discussed with the differences between the two years emphasized. The late occurrence of upwelling in 1969 accounts for the major differences between the two years. A water surface temperature station approximately 3 miles inside the mouth of Yaquina Bay was maintained in 1968 and 1969 by use of continuously recording thermographs. Daily data are given, starting in April, 1968, of surface temperature at higher high, lower low, lower high, and higher low waters. The influence of the state of the tide on bay temperatures, as well as that of other seasonal hydrographic phenomena are evident in the tabulations. (Sinha-OEIS)
W74-04935

NEAR-SURFACE OCEANIC DIFFUSION FROM A CONTINUOUS POINT SOURCE,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
R. L. Reinert.
In: Symposium on Diffusion in Oceans and Fresh Waters Lamond Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 19-27, December 1965. 6 fig, 4 ref. Nonr 285(57).

Descriptors: Dyes, Tracers, *Diffusion, *Winds, *Waves(Water), *New York.
Identifiers: *Long Island Sound, Continuous point source.

Results and discussion of a dye experiment in Long Island Sound are presented. Special attention is paid to conditions that affect small scale diffusion. The experiment is performed during a time of constant tidal current and steady winds. Cross-plume concentration data and aerial photographs are included. These data show interesting patterns thought to be due to the effects of wind and waves. (Sinha-OEIS)
W74-04937

DIFFUSION EXPERIMENTS IN COASTAL WATERS USING DYE TECHNIQUES,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. Ichiye.
In: Symposium on Diffusion in Oceans and Fresh Waters, Lamont Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 54-67, December 1965. 4 fig, 18 ref. AEC-AT(30-1)2663, Nonr 266(48).

Descriptors: Dyes, Tracers, *Diffusion, Coasts, *New Jersey.
Identifiers: Shearing currents, Bahama Banks, Long Island, Langmuir circulation, Ekman spiral, *Wind current, *Drift current, *Eddy viscosity.

The data obtained from dye experiments off New Jersey coast, on the Bahama Banks and south of Long Island since 1961 are analyzed. The areas of a visually demarcated dye patch are determined from concentration measured with fluorometers and compared with the mean square separation of a two-particle theory of diffusion, yielding t(2) and t(3) law for small and large time t respectively. Elongation of dye patches is interpreted as vertically differential advection due to a shearing current. Striations are discussed as caused by helical vortices which may be also a cause of Langmuir circulation. The curvature of the tail part of a dye patch is attributed to the Ekman spiral in a pure wind current, because, in most cases, curved tails were observed for moderate winds and in waters deeper than 20 m and because the curvature is clockwise from head to tail in the northern hemisphere. A modified theory of a drift current with eddy viscosity decreasing exponentially with depth is developed and compared with patterns of dye patches. (Sinha-OEIS)
W74-04938

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
R. Ramanadham, B. S. Reddy, and K. R. G. K. Murty.
Pure and Applied Geophysics, Vol 89, p 183-191, 1971. 6 fig, 1 tab, 3 ref.

Descriptors: Bays, Coasts, *Waves(Water), *Currents(Water), *Tides, *Monsoons, *Circulation, Sea breezes, Land breezes, Sand bars, Geomorphology.
Identifiers: *India(Kakinada Bay), Bay of Bengal.

An intensive study was made of currents in the coastal vicinity of Kakinada Bay and Godavari Point on the east coast of India. The circulation has high variability in both magnitude and direction related to the three current components namely wind currents, tidal currents and wave currents. The circulation pattern rapidly changes with the change in the phase of the tide and local winds of land and sea breeze. The littoral currents directed up-coast during premonsoon and monsoon seasons have insignificant effect across the bay opening due to the sheltering effect of the sand bar. The study is helpful for understanding the geomorphological changes of the shoreline in this region. (Sinha-OEIS)
W74-04941

A STUDY ON MIXING AND CIRCULATION IN THE ST. LAWRENCE ESTUARY UP TO 1964,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
H. J. A. Neu.
AOL Report 1970-9, December 1970. 31 p, 21 fig, 7 ref.

Descriptors: *Estuaries, *St. Lawrence River, *Mixing, *Circulation, Salinity, Temperature, Ice.

The salinity and temperature distributions in the St. Lawrence Estuary during fresh water inflows in Feb. and in May of 1963 are reported and analyzed. The mixing character of the Estuary varied from being well mixed at the head to moderately mixed in the section below the head to Tadoussac. In the deep section below the mouth of the Saguenay River, stratified conditions prevailed. The water was appreciably fresher on the south side of the channel than on the north side except off the mouth of the Saguenay River. Progressing seaward, the depth of the fresh upper layer decreased along the north shore and increased along the south shore. Temperatures in the surface layer during Feb. were higher on the north side than on the south. In May, this trend was reversed. The primary motion in the system is a longitudinal two-layer circulation in which the surface layer deviates toward the south shore and the deep layer toward the north shore. There is a net seaward flow of lower-salinity water on the south side and a compensatory flow of higher-salinity water on the north side. The Gaspe Current is a high-velocity surface stream that forms below Tadoussac and grows seaward with the entrainment of the water from the rivers of the north shore. Upwelling of the deep warmer water to the surface maintains a nearly ice-free channel along the north shore through most of the ice season. The intensity of the estuarine circulation in the St. Lawrence Estuary is determined primarily by the quantity of fresh water entering the system. (Sinha-OEIS)
W74-04944

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 2J.
W74-04945

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

ESTUARY AND COASTLINE HYDRODYNAMICS.
Engineering Societies Monographs. McGraw-Hill Book Co., Inc., New York, 1966. 756 p. A. T. Ippen, editor.

Descriptors: *Estuaries, Coasts, *Hydrodynamics, *Beaches, *Shores, *Waves(Water), *Currents(Water), *Coastal engineering, Oceanography.

The fundamentals of water waves are logically and comprehensively developed to the point where practical problems become accessible to systematic interpretation by existing theory. The presentation is directed towards the needs of those working with coastal engineering problems. Limiting boundary conditions are emphasized while general mathematical developments are limited to those essential to understand the significance of the results. (See W74-04951 thru W74-04958) (Sinha-OEIS)
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
J. W. Johnson, and P. S. Eagleson.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc., Chap 9, p 404-492, 1966. 46 fig, 4 tab, 76 ref.

Descriptors: Coasts, *Beaches, Sediments, *Sediment transport, Beach erosion, Equilibrium, *Coastal structures, *Ocean currents, *Tidal effects, Wind, Rip currents, Profiles, Particle size, *Harbors, *Littoral, Breakwaters, Shore protection, Reviews.
Identifiers: Nearshore processes, Tidal currents, Longshore currents, Wave induced currents, Breaking waves, Sand by passing.

A review is presented of the state of knowledge of coastal processes. The review is presented under the following headings: sources and characteristics of beach material; modes of transport and losses of material; quantitative analysis of transport processes; characteristics of beach deposits; characteristics of the equilibrium beach; and sediment problems at coastal structures. (See also W74-04950) (Sinha - OEIS)
W74-04951

TIDAL DYNAMICS IN ESTUARIES. PART I: ESTUARIES OF RECTANGULAR SECTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 1, p 493-522, 1966. 5 fig, 2 tab, 22 ref.

Descriptors: *Friction, *Sedimentation, Diffusion, *Tidal effects, *Estuaries, Coasts, Reviews.
Identifiers: *Cooscillating tides.

This review is limited to the development of understanding of those processes of tidal flows in estuaries which are of primary importance in dealing with diffusion and sedimentation problems. The subject is reviewed under the following headings: general review of engineering problems in tidal estuaries; general characteristics of estuaries; mathematic description of tides without friction and tides with friction; and experimental results on cooscillating tides. (See also W74-04950) (Sinha - OEIS)
W74-04952

TIDAL DYNAMICS IN ESTUARIES. PART II: REAL ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. R. F. Harleman.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 2, p 522-545, 1966. 8 fig, 3 tab, 19 ref.

Descriptors: *Estuaries, *Friction, *Tidal effects, *Equations of motion, Coasts, Reviews.
Identifiers: Tidal wave propagation, *Cooscillating tides, *Harmonic analysis.

Analysis of tidal motion in real estuaries necessarily involves a degree of approximation, since it is never possible to specify boundary conditions by exact analytical expressions. For relatively narrow estuaries it is generally permissible to neglect the effect of the earth's rotation; however, it is rarely possible to ignore the effect of friction on tidal wave propagation in real estuaries. The subjects reviewed are physical concepts of tidal motion in estuaries; methods of analysis; numerical integration methods; harmonic method; damped cooscillating tide; and Delaware Estuary. (See also W74-04950) (Sinha - OEIS)
W74-04953

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 13, p 598-629, 1966. 12 fig, 3 tab, 18 ref.

Descriptors: *Estuaries, *Salinity, *Tidal effects, Gravity, Fresh water, Mixing, Diffusion, *Coasts.
Identifiers: *Salinity intrusion, *Tidal prism.

The flow regime in estuaries is governed by four distinct dynamic influences, which determine the direction and magnitude of velocities at different elevations and at different distances from the mouth. The primary dynamic factors listed in order of their importance for the flow are as follows: (a) the effect of the tide throughout the salinity intrusion length as a function of the forcing tide at the entrance; (b) the effect of gravitational forces due to density variations between fresh water from upland sources and saline water entering from the sea; (c) the gravitational forces needed to produce a net seaward transport of fresh water; and (d) the Coriolis forces and centrifugal forces inducing transverse fluid motion due to rotation of the earth and due to the curvature of the estuary channel, respectively. (See also W74-04950) (Sinha - OEIS)
W74-04954

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 15, p 648-672, 1966. 6 fig, 1 tab, 22 ref.

Descriptors: *Estuaries, *Sedimentation, *Sediment transport, *Diffusion, Shoals, Sediment load, Flocculation, Sands, Mud - water interface, Hydraulic transportation, Flow.

Following a review of the state of knowledge of factors related to estuarine sedimentation, summaries are presented of the properties of estuarine sediments; the interaction of sediment and water flow; and diffusion characteristics and sedimentation in real estuaries. Specific aspects considered are: general flow phenomena; bed load and its source; properties and sources of mud; shoaling; flocculation; transport of granular sediments; flow of water-mud mixtures; differences in hydraulic transport between granular and flocculating materials; and consequences of human activities. (See also W74-04950) (Sinha - OEIS)
W74-04955

FIELD EXPERIENCE IN ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 16, p 673-690, 1966.

Descriptors: *Estuaries, *Sediment transport, Dredging, Navigation channels, Tidal effects, Salinity, *Mixing, *Sedimentation, *Coasts, *Currents(Water).
Identifiers: Shoaling, *Tidal currents.

This review of field experience in estuaries discusses: tidal currents, their origin, effects of tidal range, effects of diurnal inequality in tides, and phase relationships between tide and currents; salinity generated currents; estuary mixing types; sedimentation in estuaries; sedimentation in navigation slips; and dredging and spoiling practices in estuaries. (See also W74-04950) (Sinha - OEIS)
W74-04956

MODEL LAWS FOR COASTAL AND ESTUARINE MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 17, p 691-710, 1966. 11 ref.

Descriptors: *Estuaries, *Mixing, *Model studies, Density, Dimensional analysis, *Salinity, *Rivers, Flow, *Diffusion.
Identifiers: Similarity.

Model laws for coastal and estuarine models are reviewed. Subjects discussed are: dynamical approach to similarity; dimensional analysis for density flow; method of differential equations; necessity of distortion; models of unsalinated rivers; models of mixed estuaries; and mixed approaches to models. (See also W74-04950) (Sinha - OEIS)
W74-04957

TIDAL AND SALINITY MODEL PRACTICE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 18, p 711-731, 1966. 12 fig.

Descriptors: *Estuaries, *Model studies, *Tides, *Salinity, Diffusion, Hurricanes, Storms, New Jersey, South Carolina, Louisiana, Texas, Rhode Island.
Identifiers: Absecon Inlet(NJ), Charleston Harbor(SC), Vermilion Bay(LA), Delaware Estuary, Matagorda Bay(TX), Narrogansett Bay(RI), *Salt water intrusion, Flushing.

What estuary models are like and what they can and cannot contribute to the solution of estuarine problemsis discussed, rather than the technical aspects of model construction, instrumentation, and operation. The hydraulic estuary model is an engineering and scientific tool which, in the hands of those well versed in its use and in the interpretation of model test data, can contribute greatly to the solution of complex problems. The hydraulic estuary model should not be looked upon as a substitute for field and analytical studies but rather as an aid in such studies by contributing information which cannot be obtained accurately by other means. As demonstrated by specific examples, hydraulic models of estuaries are extremely useful tools in studies leading to a more complete understanding of estuarine phenomena, as well as for predicting the effects of proposed physical and other changes in estuaries on the hydraulic, salinity, shoaling, and flushing characteristics of these complex systems. However, such model studies must still be classified as art rather than science, and for this reason estuary models should be entrusted to those who have experience in the field and are thoroughly familiar with the uses and limitations of the models involved. (See also W74-04950) (Sinha - OEIS)
W74-04958

CNOIDAL WAVES IN SHALLOW WATER,
Texas Univ., Austin. Dept. of Civil Engineering.
F. D. Masch.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 1, p 1-22, 1964. 7 fig, 25 ref.

Descriptors: *Shallow water, *Waves(Water), Energy.
Identifiers: *Cnoidal waves, *Wave transformations, Shoaling, Power transmission, Long waves.

The propagation of long waves of finite amplitude in water with depth to wavelength ratios less than about one-tenth and greater than about one-fiftieth can be described by cnoidal wave theory. To date little use has been made of the theory because of the difficulties involved in practical application. The theory necessary for predicting the transforming characteristics of long waves based on cnoidal theory is presented. Basically the method involves calculating the power transmission for a wave train in shallow water from cnoidal theory and equating this to the deep water power transmission assuming no reflections or loss of energy as the waves move into shoaling water. The equations for wave power have been programmed for the range of cnoidal waves, and the results are plotted in non-dimensional form. (Sinha - OEIS)
W74-04959

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. T. J. N. P. Bakker, and T. Edelman.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 13, p 199-218, 1964. 10 fig, 1 tab, 4 ref.

Descriptors: Coasts, Mathematics, *Waves(Water), *Rivers, *Deltas, *Sediment transport, *Shallow water.
Identifiers: Coastal configuration.

The purpose is to investigate the shape of the coastline of a river delta on a coast, along which sediment is transported by waves only. In order to make the problem suitable to a mathematical treatment it is necessary to simplify to a large extent the processes occurring in nature. Instability along the circular part of the delta (all other parts are always stable) probably means, that 'spits' occur. The shape of spits is not dealt with. If the quantity of river sediment exceeds a certain amount, the delta becomes partly unstable and erosion on the lee side of the delta begins; the delta grows so large, that is acting as a partly circular 'groin' with erosion on its lee side and accretion on the weather side. (Sinha - OEIS)
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. Grijm.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers. Chap 14, p 219-235, 1964. 13 fig.

Descriptors: *Shores, *Waves(Water), Bays, Coasts, *Sediment transport.
Identifiers: *Shoreline configuration, Littoral transport, Capes, Cusps, *Wave action, Nearshore.

Theoretical studies suggest that maximum littoral transport takes place when waves approach shore obliquely. Discussed is the question of the type of shoreline to be expected when the littoral transport is ruled by the function sin 2 alpha when alpha equals 45 degrees and alpha represents the angle between the wave front and the shoreline. Shoreline configuration is theoretically expected to vary as the angle of approach varies. Correspondence between configuration and angle of approach is illustrated. When littoral transport is at a maximum cusp formation takes place. (Sinha - OEIS)
W74-04962

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
J. D. Rohrbough, J. E. Koehr, and W. C. Thompson.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 16, p 249-258, 1964. 4 fig, 9 ref.

Descriptors: *California, *Beaches, *Refraction(Water waves), Profiles, *Sediment transport, Intertidal areas, *Bays, Coasts, *Shallow water.
Identifiers: *Monterey Bay(Calif), Nearshore processes, Onshore-offshore transport, Daily variations.

Del Monte Beach, because of its sheltered location in Monterey Bay, California, provides a natural laboratory for the study of beach profile changes and other nearshore phenomena by virtue of the relative simplicity of the natural conditions that prevail there. Extreme wave refraction results in a prevalence of swell of low height and breaker angle, but having a wide range of period. Coastal currents, tidal currents, and meteorological tides are negligible. There is no significant net littoral drift, accordingly, changes in the beach profile appear to involve only onshore-offshore transport of sand grains. A breaker-height gradient occurs along the beach, so that two beach profiles were established. Gradients also occur along the beach in sand texture, beach slope, and beach curvature. The two profiles, restricted to the intertidal zone, were measured quasi-weekly and then daily over a period of nine months. The changes in sand level at both were quite similar in magnitude in spite of the wave height gradient along the beach. No clear-cut seasonal cycle and no fortnightly spring-neap tidal cycle was detected in the data. The concurrent nature of the daily variations of both sand level and waves recorded immediately off the beach leave no doubt that changing wave conditions were the primary cause of the changes observed in Del Monte Beach, even though no clear-cut relationship between the two factors was apparent. (Sinha - OEIS)
W74-04964

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
T. Ito, M. Hino, J. Watanabe, and K. Hino.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 43, p 686-712, 1964. 15 fig, 9 ref.

Descriptors: Hurricanes, *Typhoons, *Storm surges, *Dikes, *Tides, *Forecasting, *Bays, Coasts, Equations, Winds, Coastal structures.
Identifiers: *Japan(Tokyo Bay), Prediction.

Mathematical problems on the numerical calculation of storm surges are discussed. The partial differential equations of motion adopted take into account the Coriolis force and the non-linear terms such as the inertial terms and a quadratic form of bottom friction. As a result, special care must be taken in order to obtain stable forms of finite-difference equations. Inadequate forms accumulate errors to cause divergence of the step by step calculations. A set of stable forms of the finite-difference equations of motion and continuity has been derived. Japan coasts are frequently damaged by severe storm surges (Typhoon Tides). To protect the metropolitan area from storm surges, a proposal has been made to construct a dike across Tokyo Bay. A numerical calculation has been made by means of IBM 7090 to estimate for several opening widths of the proposed dike, its effects on the reduction of surges. Interactions between daily tides (astronomical tide) and surges are also discussed. (Sinha-OEIS)
W74-04971

POTENTIALS OF TIDAL POWER ON THE NORTH ATLANTIC COAST IN CANADA AND UNITED STATES,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. T. Laba.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 49, p 832-857, 1964. 10 fig, 5 tab, 2 ref.

Descriptors: Canada, United States, Tides, *Powerplants, *Bays, Coasts, *Tidal powerplants, Tidal energy, Maine, *International waters.
Identifiers: *Power sources, Passamaquoddy Bay, New Brunswick(Canada), Shepody Bay, Cobscook Bay(ME).

The most suitable locations for erection of tidal power plants on the North Atlantic Coast are reviewed and classified in respect to the possible pool arrangement. The harnessing of the tides to produce power in various layouts is described. The output from two proposed tidal power projects, Passamaquoddy Bay and Shepody Bay are compared and some auxiliary power sources to supplement the varying output of tidal power are discussed. The tide producing forces and the effect of the coastline on the tide height is also briefly described. (Sinha-OEIS)
W74-04972

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
J. N. Nielsen, and G. D. Kuhn.
Available from the National Technical Information Service as PB-228 852, $9.25 in paper copy, $1.45 in microfiche. Technical Report NEAR TR 45, (1973). 117 p, 17 fig, 3 tab, 17 ref, 1 append. OWRR C-3189(No 3698) (1). 14-31-0001-3698.

Descriptors: *Estuaries, *Dispersion, *Turbulent boundary layers, Mixing, Stratification, Flow, *Water pollution sources, Momentum equation, Fluid friction, Open channel flow, Convection, *Diffusion, *Path of pollutants.

An analytical formula representing the law of the wall and the law of the wake of turbulent boundary-layer theory has been found to represent the vertical velocity profiles of both laboratory channels and field data from real estuaries. The formula is used in an integral boundary-layer calculation method to calculate the detailed time-dependent flow field of two-dimensional estuaries. For given tidal information, only the integrated continuity and momentum equations are necessary to calculate the two parameters of the formula. The unique solution is found to pass through one or more singular points between the ends of the estuary. An analytical expression for the concentration profile is derived based on an analogy between turbulent exchange of momentum and mass. Good comparisons between theory and experiment were obtained for the flow field of a laboratory flume. Examination of data for dispersion indicates that the dominant terms of the governing equations are not diffusive in nature but are convective.
W74-04983

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
Preprint. May, 1973. 62p.

Descriptors: *Coasts, *State governments, Planning, Administration, *Regulation, *Legislation, *Management, Mapping.
Identifiers: *Coastal zone management.

A series of resumes is presented, each of which briefly summarize the present (1973) status of activities in the coastal zone by individual state governments. Information was compiled on (1) administrative structures set up to focus state efforts on coastal zonal problems; (2) legislation, executive orders, and resolutions dealing with coastal activities; and (3) research, inventory, mapping, and management efforts. (Hoffman-North Carolina)
W74-04995

LONGSHORE CURRENTS AND SEDIMENT MOTION IN THE COASTAL ZONE OF THE SEA OF AZOV,
Rostov-on-Don State Univ. (USSR).
V. A. Mamykina.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 166-170, September-October 1973. 2 fig, 3 ref. (Originally published in Gidromekhanika, No 18, p 42-46, 1972.)

Descriptors: *Currents(Water), *Sediment transport, *Deposition(Sediments), *Coasts, Shores, Sand spits, Sand bars, Waves(Water), Water circulation, Movement, Velocity, Winds, Slopes.
Identifiers: *USSR(Sea of Azov), *Longshore currents.

Longshore currents near Belosarayskaya sandspit on the northern shore of the Sea of Azov were investigated in July-August 1966-67 for their effects on sediment transport. Currents in the intermediate layer are most stable and depend little on changes in wind and bottom relief. Bottom-layer currents play an important role in erosion and sediment deposition in the coastal zone. Currents in the Belosarayskaya Bay are characterized by their low velocity--2 to 5 cm/sec. The tip of the bar (1 m from the surface, 2 m station depth, and 500 m from the water edge) is characterized by an extremely complex circulation. Sediment deposition results in the formation of underwater extensions of the bar which in time reach the surface. Prevailing bottom current velocity along the seacoast of the bar is 6-8 cm/sec at a distance of 300-500 m and 8-11 cm/sec at 1,000 m from shore, corresponding to wind speeds of 3-4 m/sec. With wind speeds of 5 m/sec or more, a current velocity of 17-20 cm/sec was observed. Maximum bottom current velocities of 30-32 cm/sec were noted after 8-12 m/sec storm squalls. Bottom deposits on the underwater slope of the Belosaraysk bar are composed of fine-grained sand (80%), whose movement begins with velocities of 8-11 cm/sec. At current velocities of 15-20 cm/sec, corresponding to yearly average wind speeds of 5 m/sec above the Sea of Azov, the transported material includes silt particles and fine- and medium-grade sand. Bottom velocities of 30-40 cm/sec suffice for transport of sediment of all fractions found on the coast and bottom of the Sea of Azov. (Josefson-USGS)
W74-05024

VARIATIONS IN THE HEIGHT OF WAVE RUN-UP ON A SANDY BEACH,
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
E. S. Tsaits, and V. V. Khomitskiy.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 152-156, September-October 1973. 2 fig, 2 tab, 8 ref. (Originally published in Gidromekhanika, No 18, p 31-35, 1971).

Descriptors: *Waves(Water), *Beaches, *Sands, Height, *Variability, Wavelengths, Slopes, Measurement, Equations.
Identifiers: *USSR(Crimea), *Wave runup.

Measurements were made of wave runup height in the western part of the Crimea on a beach composed of medium- to coarse-grained sand containing rolled shell fragments. A stretch of straight beach was selected as the observation site. Periodic measurements and leveling operations were performed during calm periods on each leveling line to assess the state of the coastal slope and beach between storms. Pickups of the marine wave gage (GM-16) were fastened to piles and connected via cables to the EPP-09 potentiometer to measure wind-wave height at various points along the underwater slope. The first recording of waves approaching from the sea was made at a depth of 7-8 m, 350-400 m from shore; the second was made at a depth of 4-5 m, 200-250 m from shore. The height of wave runup was fixed visually from a reading on a decimeter tape laid out on the surface of the beach for each of the 100-150 waves and recorded in a logbook. A total of 17 storm seconds were processed. Wave height of 1% expectation was 0.35-1.8 m; average wavelength was 10-41 m; and the angle of approach was 4-65 deg. The coefficient of variation of wave runup height ranged from 0.18 to 0.4. Formulas are given for estimation of wave height on flat slopes. (Josefson-USGS)

W74-05025

MOVEMENT OF WATER ALONG THE SHORE AND NORMAL TO IT IN THE NEAR-SHORE ZONE OF A SHALLOW-WATER COAST,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
A. I. Filimonov.
Oceanology, Vol 6, No 4, p 530-534, 1966. Trans. from Okeanologiya, Vol. 5, No. 3, 1965. 1 fig, 3 tab, 5 ref.

Descriptors: *Currents(Water), Topography, *Sediment transport, *Shallow water, Coasts, *Storms, *Winds, Beaches, Slopes.
Identifiers: *Longshore currents, Nearshore processes, *Water transport asymmetry.

From an evaluation of experimental studies of storm-generated movements of water made with recording current meters, it has been possible to trace the distribution of near-bottom velocities in the longshore movement on the profile of the submarine beach slope and to consider movements parallel to and normal to the shore in their interaction. The stretch of coast examined in 1963 had two submarine ridges, whereas in the summer of 1962 there were three ridges on the same stretch. This indicates considerable reconstruction of the profile of the submarine beach slope. Alternating movements of water normal to the shore take place against a background of prevailing longshore flow. The amount of water transported by the longshore flow is 60-80% of the discharge through a section perpendicular to the total current vector, and the magnitude of this transport is related to the wind direction relative to the shoreline. There is a fairly marked asymmetry of water discharge in the bottom longshore flow. The return flow ranges between 1 and 17%. The asymmetry of water transport is less pronounced in bottom flow to the shore, and the ratio may be unity. (Sinha-OEIS)
W74-05028

COMPOSITE ENERGY FLUXES AS FACTORS IN COASTAL FORMATION,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
I. A. Pravotorov.
Oceanology, Vol 5, No 3, p 66-68, May 1966. 12 ref. Trans. from Okeanologiya, Vol. 5, Nol 3, 1965.

Descriptors: *Waves(Water), *Currents(Water), Shores, Winds, Meteorology, Hydrology, Topography, *Eddies, *Storms, *Energy, *Shallow water.
Identifiers: Beach cusps, Scalloping, Bottom topography, Nearshore processes, *Longshore currents.

A number of phenomena taking place in the nearshore zone are not satisfactorily explained purely in terms of wave processes and the currents associated with them, or in terms of the currents accompanying surges. Among these phenomena are the wave-associated 'rhythmic' medium scale formations. Beach cusps are evidently another formation whose 'rhythmic' inception is not readily explainable by the effect of the energy flux of waves alone. The 'rhythmic' windings of the isobaths in a zone of ridges on the submarine slope of accumulation features in the form of 'harmonics' of various scales is reminiscent of similar phenomena occurring below water. Scalloping is also a feature of hydrological fronts in the presence of wind, whereas waves approaching the front are greatly attenuated, and at the front break and are destroyed. Many phenomena observed in the nearshore zone are not solely due to wave action. The formation of sand ridges and ridges of algae at an angle to the coast is reminiscent of the action of Langmuir eddies generated by the wind and, it must be supposed, interacting with the waves as they are destroyed on approaching the shore. When eddies which have developed over deep water areas during an intense storm enter shallower water they begin to affect the sea floor. Smaller eddies induced by the larger eddies and maintained by wind energy continue to advance towards the shore until they are completely destroyed in interaction with the bottom and with the waves; this affects the material-moving capacity of the waves and is reflected in coastal dynamics. (Sinha-OEIS)
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 2J.
W74-05032

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
D. L. Book, E. Ott, and A. L. Sulton.
Available from NTIS as AD-768 296, $2.75 in paper copy. NRL Memorandum Report 2642, September 1973. 17 p, 4 fig, 12 ref.

Descriptors: *Shallow water, Gravity, *Interfaces, Fluid mechanics, Dynamics.
Identifiers: Riabouchinsky formulation, Gas-dynamic analogy, Rayleigh-Taylor instability, Fluid layers.

The nonlinear evolution of the Rayleigh-Taylor instability in the long wavelength limit is investigated for an incompressible fluid supported against gravity (or inertial forces) by a massless fluid and bounded above by a rigid wall. In plane geometry, the equations are identical with those of shallow water theory, but with the sign of the gravitational acceleration reversed. They are rewritten in the Riabouchinsky (gas-dynamic analogy) formulation and solved numerically. The shallow water approximation permits a solution for the motion of the interface without reference to the detailed motion of fluid in the interior. There is a range of parameters in which the nonlinear development of the Rayleigh-Taylor instability in an ideal fluid can be simply described in terms of the motion of the interface, that is, essentially one-dimensionally. The resulting equations have been solved numerically to yield a universal functional form of this motion. The time over which this solution can be expected to hold depends on the parameters with which it is scaled. The solution found here is only valid until vertical displacements become of the order of the wavelength. Thereafter the flow is essentially two-dimensional and the shallow water description is not applicable. The results given will be useful in liner stability analyses, however, if the fastest growing wavelength observed experimentally is of the order of or larger than the the minimum radius the liner is designed to reach, or if the growth rates are such that the 'dwell time' of the liner is comparable to that required to reach the breakdown point of the model. (Sinha - OEIS)
W74-05034

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
For primary bibliographic entry see Field 2J.
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2J.
W74-05042

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W74-05061

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-05114

THE HYDROGRAPHY OF THE BROADKILL RIVER ESTUARY, DELAWARE,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. Dewitt, and F. C. Daiber.
Chesapeake Science, Vol 14, No 1, p 28-40, March 1973. 9 fig, 1 tab, 13 ref. OWRR A-006-DEL(4).

Descriptors: *Estuaries, *Delaware, *Water circulation, Water quality, Water pollution, Saline water intrusion, Dissolved oxygen, Tides, Turbidity, Mixing, Hydrography.
Identifiers: *Broadkill River(Del).

The hydrography of the Broadkill River, a narrow, shallow estuary in southeastern Delaware, was studied from July 1966 through February 1971. Measurements of current velocity, tide stage, salinity, water temperature, dissolved oxygen, pH, and turbidity were made at several stations along the course of the estuary. The Broadkill River has characteristics of both a partially-mixed and well-mixed estuary. During normal runoff the system discharges 130,000 cu m of freshwater per tidal cycle. The flushing time of the entire system increases from 10.3 tidal cycles during high runoff to 24.2 tidal cycles during low runoff. The lower estuary, the most seaward 25% of the system, is sectionally homogeneous during 90% of each tidal cycle. Homogeneity is maintained by strong tidal currents. The flushing time of the lower estuary is relatively constant and increases from 0.6 to 0.9 tidal cycle with decreasing freshwater runoff. The tidal river, the farthest upstream 40% of the system, is rarely invaded by saline water from the upper estuary. This section is polluted through the discharge of organic wastes into the river at a point 0.5 km downstream from the river's source. Downstream from the source of pollution, anoxic conditions are present from spring through autumn and are relieved only during the coldest months of the winter. (Knapp-USGS)
W74-05122

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-05140

RHODE ISLAND'S BARRIER BEACHES: VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Marine Technical Report No 4, 1973. 118 p, 3 fig, 19 ref, 3 append.

Descriptors: *Barrier islands, *Beaches, *Water resources development, *Rhode Island, Management, Reviews, Evaluation, Recreation facilities, Erosion control, Beach erosion, Hurricanes, Shore protection, Ocean waves, Environmental effects, Marshes, Ecology, Social aspects.
Identifiers: *Barrier beaches.

Information is summarized and evaluated on management problems of the barrier beaches along Rhode Island's ocean coast. A barrier beach is a narrow strip of land made of unconsolidated material that extends roughly parallel to the general coastal trend and is separated from the mainland by a relatively narrow body of water. In the great majority of cases Rhode Island barriers are the seaward boundaries of coastal ponds, many of which are salt or brackish. The barriers have been formed by longshore currents and waves that have deposited sediments, chiefly sand and pebbles, across shallow embayments. The barriers are low in profile and are highly vulnerable to hurricane damage. (Woodard-USGS)
W74-05152

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W74-05296

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-05332

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
D. Chapman.
American Journal of Agricultural Economics, Vol 55, No 3, p 433-440, August 1973. 6 tab, 24 ref, 1 append.

Descriptors: *Financial feasibility, *Cost-benefit analysis, *Irrigation programs, *Desalination, *National income, *Investment, Operating cost, Governments, Systems analysis, Optimization.
Identifiers: *Agro-industrial projects, *Social benefits, *United Arab Republic(El-Hamman-Egypt).

In recent years, the possibility of desalting sea water to produce irrigation water for large-scale commercial agriculture and industry has been considered as a means of stimulating cooperation and economic development in the Middle East. This study investigates the financial feasibility and the social benefits and costs of nuclear desalination agro-industrial projects. Financial feasibility and national income benefit analyses are performed. The financial analysis determines project investment and operating costs, revenues, cash flows, and profitability with likely market prices and government policies. The benefit-cost analysis examines the effect of the project on macroeconomic goals such as employment, foreign trade, capital scarcity, and national income. The project site is El-Hamman, 30 miles west of Alexandria and chosen because of its soil characteristics, present unsettles status, and nearness to market and port facilities. Project design was carried out in three simultaneous phases: selection of agricultural and livstock commodities for maximum profit from use of project water; examination for maximum profit of industries having electric-intensive production processes; and engineering examination of 500-megawatt electric power plants operated in association with desalination plants to determine least costly methods of production. As presently designed, such a complex appears to require deficit financing, provide little employment, retard national income growth compared to other investment opportunities, and increase the foreign exchange deficit. (Bell-Cornell)
W74-05382

3B. Water Yield Improvement

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

WHEAT PRODUCTION PROBLEMS AND POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Ankara (Turkey).
For primary bibliographic entry see Field 3F.
W74-05221

3C. Use Of Water Of Impaired Quality

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
A. A. Sid'ko, S. I. Myasishchev, V. P. Bayakina, and V. A. Sveshnikov.
Pochvovedeniye, No 12, p 133-137, 1972. 4 tab.

Descriptors: *Land reclamation, *Drainage practices, *Leaching, *Saline soils, *Drains, Salts, Water balance, Evaporation, Permeability, Rice.
Identifiers: *USSR(Golodnaya Steppe).

Experiments in rice paddies showed that strongly saline soils can be desalinized in a single season by using deep permanent drains and closely spaced shallow temporary drains. Investigations were conducted on Meadow-Sierozem soil in the Golodnaya Steppe where total toxic salt content of the soil ranged from 0.5% in the upper layer of the zone of aeration to 2.5% in the lower layer, and permeability in these layers ranged from 0.52 m/day to 0.03 m/day, respectively. Deep permanent drains spaced 330 m apart and shallow temporary drains spaced 20 m apart desalinized the soil to a depth of 120-130 cm within 72 days using 5,000 cu m of water/ha and to a depth of 150 cm within 112 days using 8,300 cu m of water/ha. Under the same conditions but with more frequent application of deep drains during this time, the soil was desalinized to a depth of 4.5 m. (Josefson-USGS)
W74-05018

POSSIBILITIES OF SUPPLY AND PROPER USE OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Iran). Research Div.
B. Yazdani.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 212-224. 12 tab.

Descriptors: *Irrigation, *Dry farming, *Agriculture, Arid lands, Cereal crops, Soils, Irrigation systems, Irrigation canals, Irrigation design, Irrigation programs, Irrigation wells, Groundwater, Groundwater recharge, Groundwater resources, Water resources, Water resources development, Water supply development.
Identifiers: *Iran(Garmsar area).

The garmsar area of Iran is an arid zone of approximately 50,000 hectares on the edge of the great salt desert of central Iran. A very dry climate prevails in the area, offering insufficient water to irrigate all the arable lands. High temperatures and soil-drying winds characterize the climate. The Hablehrud River and its tributaries are the principal source of agricultural water in the region with an annual flow of 247.7 mcm. which is fairly saline. Groundwater extraction offers only an additional 35 mcm. of similarly saline water. These water quality conditions contribute to the cause of the salty and calciferous soil of the region. Current irrigation development includes a canal system of about 920 km total which diverts the flow of the Hablehrud. This system irrigates barley and wheat primarily, but some cotton is also cultivated. The regional development plan includes increased uses of groundwater, saline soil reclamation, additional surface water development and recharge augmentation. These steps are expected to greatly improve the agricultural productivity of Garmsar. (Muller-Arizona)
W74-05217

GENERAL REPORT ON DEVELOPMENT AND UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
A. Ghobadian, and H. Siadat.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972. p 248-257. 1 tab.

Descriptors: *Dry farming, *Agriculture, *Saline soils, *Soil chemistry, Salinity, Chemical properties, Geochemistry, Geology, Leachate, Soil chemical properties, Soil environment, Soil management, Saline water, Saline water systems, Soil-water-plant relationships, Land, Arable land.
Identifiers: *Iran.

Over 90 percent of Iran receives less than 500 mm of precipitation annually. Peculiarities in geomorphology and land degradation have led to the development of saline soils in the region. The natural processes of salinization of soils are discussed, including geology and geochemical factors, wind effects, geomorphology, biological factors, and surface water effects. The high salinity or surface waters is determined to be a significant factor in soil salination during periods of extensive annual flooding. Manmade or secondary salinization is also found to be a significant factor, usually taking the form of irrigation and soil mismanagement. A decrement in groundwater quality is also noted. The application of saline groundwater in irrigation enhances soil salination. These saline soils offer crop yields under the optimum production levels. Salination effect studies are proposed as are studies in salt-tolerant crop breeding. Salinity control measures are proposed, including land drainage, irrigation management, and leaching. Farmer awareness of both salinity problems and control methods is emphasized. (Muller-Arizona)
W74-05218

THE POSSIBILITY OF SODA FORMATION IN SOIL BY BIOCHEMICAL MEANS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05271

EXPERIENCE OF MEADOW SOIL DESALINATION IN MURGAb OASIS (IN RUSSIAN),
D. Sheripov.
Probl Osvoeniya Pustyn'. 2. p 53-57, 1972, English summary.
Identifiers: Chlorides, Magnesium, Meadow, Oasis, Sodium sulfide, *Soil desalination, *USSR(Murgab Oasis), *Salts, *Saline soils, Soil leaching.

Utilization of closed horizontal drainage caused a sharp change in soil salt regime in the irrigated areas. In lowlands the danger of salt accumulation occurs towards the autumn at the backwater in the collector. When reclaiming the heavy saline fallow lands, very intensive leaching of sodium chloride is observed. The amounts of sodium sulfide and Mg decrease by 2-2.5 times.--Copyright 1973, Biological Abstracts, Inc.
W74-05368

3D. Conservation In Domestic and Municipal Use

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W74-04989

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
For primary bibliographic entry see Field 8C.
W74-05093

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

3E. Conservation In Industry

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
For primary bibliographic entry see Field 6D.
W74-04912

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
For primary bibliographic entry see Field 5D.
W74-05254

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-05275

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
For primary bibliographic entry see Field 5D.
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5D.
W74-05282

A PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
For primary bibliographic entry see Field 5D.
W74-05289

3F. Conservation In Agriculture

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05002

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5B.
W74-05199

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W74-05205

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
H. N. Stapleton, D. R. Buxton, F. L. Watson, D. J. Nolting, and D. N. Baker.
Arizona Agricultural Experiment Station, Tucson, Technical Bulletin 206. 1973, 124 p. 44 fig, 1 tab, 38 refs.

Descriptors: *Cotton, *Plant growth, Model studies, *Computer models, *Simulation analysis, Field crops, Fiber crops, Agriculture, Germina-

tion, Crop production, Growth rates, Growth stages, Height, Productivity, Soil-water-plant relationships, Climatic data, Testing, Productivity, Crops, Cultivation.

The cotton production system is defined by a multi-component flow-chart model. The principal component of the system is the actual cotton plant. A digital computer simulation of a cotton plant is developed. This model uses hourly input data of air temperature, water vapor pressure gradient, incident short wave radiation, carbon dioxide concentration, soil moisture tension, soil temperature, soil impedance to elongation of the hypocotyl, sun altitude and acute angle between sun azimuth and cotton rows to generate hourly water content weight percentage in the seed during the preemergence growth stage and to generate hypocotyl length, change in hypocotyl length, percent of seed that have emerged and percent of seed energy that has been expended during the post emergence growth stage. This model is validated with actual data. Five appendices are included which deal with model input estimation, program variable identification, program use, sample input and output and field monitoring techniques. (Muller-Arizona)
W74-05213

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

THE SUMMER FALLOW SYSTEM,
Oregon State Univ., Corvallis.
T. G. Zinn.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 91-108. 6 fig, 6 tab.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Fallowing, Rotations, Soil management, Crop production, Farm management Soil moisture, Soil water, Water conservation, Water storage, Cereal crops, Field crops, Forages, Mulching, Rain, Rainfall, Water sources, Soils, Semiarid climates, Cultivated lands.
Identifiers: *Turkey.

While rainfall is too limited to permit annual cropping in many arid and semi-arid areas, such regions including parts of Turkey and the United States, do lend themselves to both partial year cropping and fallow. Such a procedure was found to give a higher total production than annual cropping for winter wheat. The primary purpose of the fallow system is to accumulate moisture in the soil root zone area during no-production periods for the crop to consume during growing periods. The maximum accumulation will occur when proper weed control reduces unwanted evapotranspiration, when the soil has a high infiltration rate to incident rainfall, when the surface of the field is sloped such that surface movement of water is sufficiently slow for proper infiltration, when irregular tillage is avoided which increases soil evaporation surfaces and when a moisture barrier such as mulch is introduced to store accumulated moisture. Such fallow procedures are found optimal in the summer months during which only about 25 percent of the annual rain falls. Summaries are presented for the testing of 80 different treatment combinations over a two-year experimentation period for a study area in Turkey. These studies offer the additional conclusion that treatment timing is important in the fallow process and that mechanization is necessary for the proper timing to be realized. (Muller-Arizona)
W74-05215

AGRICULTURAL ASPECTS OF ARID AND SEMI-ARID ZONES,
Soils Inst., Tehran (Iran).
A. F. Mahdavi.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 52-60.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Land development, Arable land, Crops, Cultivated lands, Arid climates, Land classification, Land resources, Semiarid climates, Soils, Land use, Ranges, Pastures, Irrigation, Irrigation efficiency, Irrigation programs, Irrigation water.
Identifiers: *Iran.

Seventy-three percent of Iran is arid or semi-arid land, and much of the remainder is mountainous. If Iran is to keep pace with its rapidly growing population, it must expand its agriculture. In attempting is determine the optimal land usage, maps classifying land resources with respect to agriculture (both dry land and irrigated), range, forests and recreation were constructed. Development is planned in light of the recommendations of these surveys. Irrigation and drainage techniques, field leveling and grading, crop water demand, and soil fertility-irrigation interaction are additional technological considerations in the planning process. Four areas of research offer Iran improvements in agricultural yield. Dryland farming, saline soil reclamation, use of water of impaired quality and fertilization are being explored for this purpose. The overall priorities of national research coordination, support of research institutions, integration of activities on the farm level, and regional, national and international exchange of experience are the underlying factors that will lead to the eventual success of Iran's agricultural planning. (Muller-Arizona)
W74-05216

POSSIBILITIES OF SUPPLY AND PROPER USE OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Iran). Research Div.
For primary bibliographic entry see Field 3C.
W74-05217

EVALUATION OF THE HYDROLOGICAL ASPECTS OF THE AGRICULTURAL STUDIES IN ARID AND SEMI-ARID ZONES OF TURKEY,
Ankara Univ., Adana (Turkey). Faculty of Agriculture.
O. Tekinel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 225-247. 10 tab, 2 fig.

Descriptors: *Arid lands, *Land use, Water supply, Water supply development, Arid climates, Semi arid climates, Dry farming, Evaporation, Land classification, Hydrologic data, Hydrology, Water utilization, Water demand, Water resources, *Agriculture, Climates, Data collections, Droughts.
Identifiers: *Turkey.

Hydrological and related activities in Turkey, including the definition of climatic zones, the classification used for defining the arid and semi-arid zones, and hydrological activities which have been carried on in Turkey, are discussed. Agricultural drought studies with respect to hydrology and a proposal for drought studies in the agricultural areas of arid and semi-arid zones are summarized. An arid zones research institute should be established to study the problems of the area. Hydrologic surveys are proposed to gather data on climate, land classification, water requirements, water utilization and drought frequency. Studies in evaporation control, usage of water of impared quality, soil-water-plant-energy relationships, and irrigation are proposed. These studies are expected to furnish the necessary data for the evaluation of dryland regions with respect to hydrology and agricultural potential. (Muller-Arizona)
W74-05219

EROSION CONTROL AND VEGETATIVE COVER UNDER DRYLAND CONDITIONS IN TURKEY,
Istanbul Univ. (Turkey). Faculty of Forestry.
S. Uslu.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 159-163.

Descriptors: Agriculture, *Arid lands, *Erosion, *Soil erosion, *Erosion control, Arid climates, Soils, Vegetation, Wind erosion, Weathering, Soil types, Ground cover effects, Dry seasons, Winds, Shelterbelts, Windbreaks, Vegetation effects.
Identifiers: *Turkey.

The morphology of the topography of Turkey is such that the moist air of the surrounding seas is deflected by the ringing mountains and prevented from reaching the central Turkish plains, causing the central plains to be extremely arid. The soils of this region are thus susceptible to wind and water erosion, both because of the inherent dryness of the soil and because of the lack of holding vegetation. Examples of such erosional conditions are cited. Various control measures are proposed, including the construction and cultivation and wind shelterbelts. Specific plant performances in such belts are reported. Various forms of vegetative cover to hold the soil are also presented. (Muller-Arizona)
W74-05220

WHEAT PRODUCTION PROBLEMS AND POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Ankara (Turkey).
A. Demirlicakmak.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 172-178. 2 tab.

Descriptors: *Wheat, Agriculture, *Dry farming, *Arid lands, *Irrigation water, Fallowing, Farm management, Cereal crops, Grains(Crops), Field crops, Irrigation, Soils, Soil water, Soil moisture, Moisture content, Antecedent moisture, Infiltration, Moisture availability, Retention, Soil management, *Water yield improvement.
Identifiers: *Turkey.

Wheat is the principal agricultural commodity of Turkey. The production of this commodity has increased an average of 33 percent per annum over the last 20 years to a level where little land remains for agricultural expansion. Much of the land currently in cultivations is in arid areas with insufficient water for optimal production. Current research is aimed at augmenting the quantities of water used in irrigation and improving irrigation methods to increase wheat production. This additional irrigation water is to be obtained by water conservation practices on available precipitation water. These practices include weed control, infiltration encouragement through tillage practices, and fallow processes. New varieties of wheat also offer some possibilities in increased production. The Wheat Research and Training Center in Ankara, Turkey, is conducting research in these fields. (Muller-Arizona)
W74-05221

LAND AND WATER RESOURCE DEVELOPMENT FOR CROP PRODUCTION IN TURKEY,
Ankara Univ. (Turkey). Dept. of Agricultural Engineering.
A. Balaban.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 138-150. 2 tab.

Descriptors: *Water resources development, *Land resources, *Land development, Water resources, Land, Land Management, Land reclamation, Land use, Water supply, Water supply development, Groundwater, Groundwater resources, Groundwater availability, Irrigation, Irrigable land, Irrigation programs, Drainage, Surface drainage, Salinity, Soils.
Identifiers: *Turkey.

Land and water resources, the existing level of development and problems associated with it, and new approaches to such problems on the Turkish peninsula are reviewed. Turkey has a total land area of 78.1 million hectares, of which about 35 percent of this is cultivated, 26 percent is in grass and pastureland and the remaining 39 percent is forest and unproductive land. The agricultural portion has expanded greatly in recent years, in part due to reclamation projects of swamps and wild olive groves. A survey of the available water resources in Turkey shows that the 26 principal drainages in the country have an annual potential of 166 billion cubic meters. Of this about 80 billion cubic meters can be feasibly developed. An additional 8 billion cubic meaters of safe yield groundwater make the annual total available water resources of Turkey 88 billion cubic meters. Existing levels of cropland expansion and irrigation development are discussed. An additional expansion of 25.5 million hectares of agricultural land may be developed from dry lands and supported by the available water resources. (Muller-Arizona)
W74-05222

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6A.
W74-05223

IMPROVING FARM PRODUCTION IN REGIONS OF LIMITED RAINFALL,
Agency for International Development, Washington, D.C. Office of Agriculture and Fisheries.
O. J. Kelley.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 12-24. 1 tab.

Descriptors: *Dry farming, *Water harvesting, *Rain water, Water conservation, Agriculture, *Arid lands, Farm management, Precipitation(Atmospheric), Soil water, Runoff, Water yield improvement, Water storage, Water supply, Soil-water-plant relationships, Soil moisture, Water management(Applied), Infiltration, Land use, Land management.

Arable land in dry regions is normally irrigated to make it agriculturally productive. Such irrigation is usually done with nearby water supplied. When such water supplies are not availabl, these lands are forced to produce with the limited amount of precipitation water available. These conditions lead to the necessity of dry land farming: the conservation of the limited available precipitation water and its optimal use in agriculture. The first aspect of dryland farming entails runoff loss minimization, soil water storage, crop yield incrementation with increased water supply, snow conservation, and optimal use farming methods. The second aspect involves water harvesting, the increase of available water through collection and redistribution systems. If these aspects are realized, it remains to employ the stored water in the most efficient method possible. This must be done by evaluating the optimal use to which the water and associated land may be put (grazing, cultivation, etc) and the optimum technique by which this use may be realized. These dry land farming procedures, when practiced within an overall development plan, lead to the maximum production of lands with otherwise insufficient water supply. (Muller-Arizona)
W74-05224

THE ARID ZONE PROBLEMS IN TURKEY,
Ankara Univ. (Turkey). Faculty of Agriculture.
S. Elci.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 45-51.

Descriptors: *Agriculture, *Dry farming, *Forages, Pastures, Pasture management, Crop production, Forage grasses, Grazing, Irrigatin practices, Range management, Soil management, Regional development, Irrigable land, Irrigation, Land development, Land management, Arid lands, Arid climates, Asia.
Identifiers: *Turkey.

The population growth rate of Turkey indicates that if its people are to be fed in the future the agriculture of that country must be greatly expanded. Several limiting factors exist concerning such expansion. Much of Turkey's agricultural land is arid. Precipitation is both little and poorly distributed through the growing year. An analysis of agricultural development priorities shows the development and exploitation of pasture lands is a desirable course of action. Several good forage crops which would be useful to this end are not grown in Turkey, although their origin is there. The cultivation of plants for optimal forage production should be based on rotation, soil and climatic conditions for plant production in the region. Twenty-four points of consideration are presented which must be examined to this end. An additional 16 long-term research topics are presented which should be examined for long-range effective agriculture development. The rapid development of arid zone agriculture, such as that required by Turkey, should be conducted along these study guidelines for solid planning bases. (Muller-Arizona)
W74-05225

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable, and S. C. Martin.
Journal of the Arizona Academy of Science, Vol 8, No 3, p 127-134, October 1973. 5 tab, 9 fig, 8 ref.

Descriptors: *Succession, *Mesquite, *Grasslands, Grasses, Brush, Desert plants, Range management, Weed control, Grazing, Semiarid climates, Vegetation, Forage grasses, *Arizona, Control, Cutting management, Invasion, Plant populations, Range grasses, Plant groupings.

The encroachment of velvet mesquite on the grass-covered rangeland of the semiarid southwestern United States has become a significant problem to grazing in the last half century. It has been shown that as few as 25 mesquite trees per acre can reduce the available perennial grass production by fifty percent. This study examined several grassland plots at two locations in southern Arizona in an attempt to determine the invasion rates of mesquite into the grassland environment. Stem diameter, plant height, and crown width were the plant parameters considered and plant density was the plant community parameter employed. Four samplings over a 20-year period of record were made and mesquite occurrence data analyzed. Velvet mesquite was found to increase significantly in the study areas during the period of observation. Plots which remained undisturbed during the entire observation period showed dramatic reductions in grass productivity due to mesquite encroachment. Bulldozing and burning of plots interrupt mesquite invastion only temporarily, indicating persistent periodic control measures would be required for proper control. Herbaceous vegetation was not influenced by mesquite population changes as was the perennial grass. Early and repeated control measures are optimum. (Muller-Arizona)
W74-05226

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
S. C. Martin, and H. G. Reynolds.
Journal of the Arizona Academy of Science, Vol 8, No 2, p 56-67, June 1973. 5 fig, 1 tab, 179 ref.

Descriptors: *Desert plants, *Deserts, *On-site laboratories, *Research facilities, Pastures, Climates, Grasslands, Ecology, Range management, Semiarid climates, Arid lands, Ranges, Range grasses, Forage grasses, Brush, Vegetation regrowth, Land use, Sites, Habitats, *Arizona.

The Santa Rita Experimental Range, a 50,000-acre experimental facility 30 miles south of Tucson, Arizona, is a research site for semidesert ecosystems that has been used continuously for 70 years. Rainfall averages from 10 inches per year at the lower elevations to almost 20 inches per year in the uplands. The area is predominantly grass and brushland with a great variety of semiarid land wildlife. To date studies include grazing, range seeding, grass-shrub ecology, wildlife, and desert biomes. Because of its location, the area lends itself to a variety of arid and semiarid land studies associated with hydrology and water resources. Since the Range is purely a study site, the natural environment has been distrubed to a minimum, making Santa Rita Experimental Range an ideal outdoor laboratory. (Muller-Arizona)
W74-05227

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5D.
W74-05228

NUTRIENTS FROM TILE DRAINAGE SYSTEMS, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5B.
W74-05229

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05279

DENSITY OF GROWTH AND LEVEL OF FERTILIZATION AS INFLUENCING THE WATER CONSUMPTION OF MAIZE, (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
G. Nikolov.
Rasteniev'd Nauki. Vol 9, No 4, p 69-82. 1972. Illus. (English summary).
Identifiers: *Fertilization, *Growth, *Corn(Field), Water consumption, *Bulgaria, Irrigation.

The water consumption of maize grown under irrigation on leached chernozem smolnitsa soil was studied in 1966-1969 at crop stands of 32,000, 44,000 and 58,000 plants/ha, at row spacings of 70 and 90 cm and at levels of fertilization in kg/ha of N100P80K10 and N200P160K80. The consumptive use of water of maize varies comparatively a little with increasing the number of plants per hectare and with raising the level of fertilization and does not vary in dependence on the inter-row spacings. A rectilinear relation exists between the 24-hr values of the consumptive use of water, the leaf area, the increment in the biological yield and net productivity of the photosynthesis which determines the correlation between the rhythm of water consumption during the crop-season and the related productivity of organic substance. Water withdrawn from the upper 50 cm soil layer accounts for 66.8-68.9%. from the 51-100 cm layer for 23.8-25.0%, and from the 101-200 cm soil layers

for 7.2-8.5% of the water consumption of maize. The total amount of irrigation water given to the crop accounts for 37.0-37.5%, rainfall during the crop-season for 37.1-39.3% and the withdrawal from the water stored in the soil accounts for the least percentage. The consumptive use of water of maize grown in South-Bulgarian chernozem smolnitsa soils, at a crop density of 44,000 plants/ha and at fertilizer level of N200P160K80 in kg/ha amounts to 523 mm and its 24-hr values average 3.96 mm. The biological coefficient of water consumption after A. M. Alpatev varies between 0.46 and 0.51 and has a mean value of 0.50.--Copyright 1973, Biological Abstracts, Inc.
W74-05339

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 2J.
W74-05340

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
J. B. Manandhar, and G. W. Bruehl.
Phytopathology. Vol 63, No 3, p 413-419. 1973. Illus.
Identifiers: *Cotton diseases, *Fungi, *Fusarium-Oxysporum-F.-Sp.-Vasinfectum, Growth, In-vitro interactions, Soils, Temperature, *Verticillium-Albo-Atrum, Wilt, Hydrogen ion concentration.

Fusarium oxysporum f. sp. vasinfectum and the microsclerotial form of Verticillium albo-atrum pathogenic to cotton grew progressively slower in soil as the predominantly matric water potentials in soil were lowered below 0. In contrast, both fungi grew optimally at about -10 to -30 bars at 25C in either agar media or in soil when water potential was regulated osmotically. The osmotic stimulation of both fungi was independent of the solute used and occurred in agar media when water potentials were adjusted with NaCl, KCl, CaCl2, MgCl2, a salt mixture, or sucrose, and on straw in sterile soil when water potentials were osmotically adjusted. At water potentials below the stimulatory range, growth decline linearly and was zero at near -100 bars for V. albo-atrum and at near -115 bars for F. oxysporum. A water stress of -40 to -60 bars reduced the growth of both to about half the maximum rate. Both fungi grew well at pH values ranging 5.2-8.6, and no significant interactions of pH and water potential were observed. A highly significant temperature X water interaction occurred in both wilt fungi: the magnitude of growth stimulation with slightly reduced osmotic water potential increased with rising temperature. No new in vitro responses to water, pH, temperature, or to interactions of these were observed that explain the different distributions of these wilt fungi in nature.--Copyright 1973, Biological Abstracts, Inc.
W74-05341

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
For primary bibliographic entry see Field 5B.
W74-05346

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
K. I. Baltyan.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 193-202, 1970.
Identifiers: Cereal crops, Frost, Grass, Perennial grasses, Plowing, Potato, Pulses, *Sod podzolic soils, Soils, Spring, Water supply, Winter, *Root zone, *USSR(Moscow region).

The water supply for crops on sod podzolic soils in the Moscow region, USSR, may be improved by a single meliorative plowing, whereby the humus horizon is left on the top and the underlying podzolic and illuvial horizons are intermixed. Thus, the depth of the root zone may be extended to 30 cm in the northern and eastern regions and to 40 cm in the southern and western regions of the non-chernozem zone for perennial grasses and winter crops that complete their growth before the onset of autumn frosts. For spring cereal crops, pulses, potatoes and other crops of low resistance to frost, the root zone can be deepened to 20 and 30 cm.--Copyright 1973, Biological Abstracts, Inc.
W74-05370

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
R. Koriat, and G. Shpekht.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 177-186. 1970.
Identifiers: Beet, Clover, *Fertilizers(Mineral), Fodder, Grass, Irrigation, Liquid manure, Minerals, Nutrition, Potato, Pure, *Sewage, Sugar, Nitrogen, *Farm wastes, *Nutrients, *Phosphorus.

More nutrients, especially P, are extracted by the field crops irrigated with plain water than without irrigation. The N doses and irrigation rates for sugar and fodder beets, potato, grasses and clover recommended in the German Democratic Republic are given. The amount of nutrients in sewage cannot compensate the large uptake by the crops (on the average, 100 mm communal sewage contains 60 kg N, 76 kg P2O5 and 42 kg K2O). Sprinkling with sewage is supplemented with P 70-90 and K 80-100. N fertilizers are especially important. The doses of liquid manure and its application dates for field crops and hay cutting pastures are given. Liquid farmyard manure contains 0.45% N, 0.08% P and 0.23% K. Assimilation of nutrients from liquid manure amounts to 40-80% N, 55-90% K, depending upon the dates of application. The utilization factor for P is 50%.--Copyright 1973, Biological Abstracts, Inc.
W74-05371

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
V. T. Kolesnichenko.
Inf Byull Sib Inst Fiziol Biokhim Rast Sib Otd Akad Nauk SsSR. 6. p 140-142. 1970.
Identifiers: Air, Crops, *Moisture, Soils, *Temperature, Thermal regime, *USSR(Biryusa River), *Podzolic soils.

Observations were carried out on sod podzolic and gray forest podzolized soils on the left bank of the Biryusa River, north of Taishet, USSR. The hydrothermal air regime features in the soils and the adjacent 0-200 cm air layer were determined. The determinations include the drop of air temperature at night in the different phases of plant development, the types of frosts in air and on the soil surface, and their effect on the temperature regime in the top 50-cm-layer of soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
P. S. Bulakhova.
Tr Kaz S-Kh Inst. Vol 13, No 2, p 117-121. 1970.
Identifiers: Barley, Beet, Corn, *Crops, Meadow, Peas, *Sierozem soils, Wheat, *Soil aggregates.

The aggregates were separated on sieves in water after preliminary capillary saturation of the soil sample. Observations indicated that the meadow sierozem soils possess good water-stable structure. The total aggregates larger than 0.25 mm in the top 60-cm layer make up from 65-79%, of which the most valuable aggregates, 5-1 mm, amount to 26%. The effect of different crops on the aggregate composition of the soil varies. Under corn the total aggregates exceeded by 6-8% the amount under wheat, down to a depth of 40 cm; it was higher by the same amount under wheat at the depth of 40-60 cm, and mainly on account of aggregates measuring 2-1 mm. The content of aggregates was markedly lower under barley following wheat after beet, down to 45-28%, while aggregates measuring 5-1 cm dropped to 19-25%. The decline was marked in particular among aggregates 2-1 mm, being only 11% in the upper horizon under barley, as against 32 and 20% under corn and wheat, respectively. The effect of pea crops on soil structure proved to be most favorable.--Copyright 1973, Biological Abstracts, Inc.
W74-05374

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
K. E. Burzi.
Ahrokhim Hruntozn Resp Mizhvid Temat Zb. 15. p 186-190. 1070.
Identifiers: *Irrigation, Massif, *Salinization(Soils), *USSR(Krasnoznamenskii),, *Saline soils, Drainage.

The rise of the groundwater levels from 4 to 2 m, due to filtration from the main canal and the irrigation network, led to secondary salinization of low-lying areas on the territory of the 'Pamyat' Il'icha' State Farm (sovkhoz), USSR. Swamping and secondary salinization can be stopped and prevented by drainage.--Copyright 1973, Biological Abstracts, Inc.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
M. M. Tashkuziev.
Nauchn Tr Tashk Univ. 378. p 187-194. 1970.
Identifiers: *Agrochemical properties, Irrigation, *Phosphates, *Sierozems, *Soil types, Fertilizer.

Data are presented on the studies conducted on virgin, newly irrigated and old-irrigated soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
For primary bibliographic entry see Field 2G.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
Z. Ban'okh.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 169-176. 1970.
Identifiers: Alfalfa, Beets, Corn, *Fertilizers(Mineral), Irrigation, Minerals, Potato, Sugar, *Czechoslovakia, *Soils(Irrigated), *Phosphorus, *Potassium.

Long-term experiments were conducted in the main irrigated regions of Czechoslovakia with doses of P and K for potato, alfalfa, sugar beet and corn. Large doses of fertilizers were slightly effective, but the use of such doses should be considered from the standpoint of improving soil fertility.--Copyright 1973, Biological Abstracts, Inc.
W74-05379

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05385

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
G. McManis.
Available from National Technical Information Service as PB-228 698 $8.00 in paper copy, $1.45 in microfiche. MS Thesis, May 1972. 94 p, 28 fig, 3 tab, 10 ref, 5 append. OWRR B-016-NEB(1).

Descriptors: *Simulation analysis, *Hydrographs, Storms, *Computer programs, *Drainage systems, Channels, *Networks, Runoff, Systems analysis, Mathematical models, *Nebraska, City planning, *Urban drainage, Storm drains.
Identifiers: Lincoln(Neb).

Dynamic simulation techniques can provide urban water planners with needed hydrologic response information. Such techniques for modeling the interactions between (1) a storm bounded by a generalized polygon, and (2) any arbitrarily distributed network over which the storm passes are described and demonstrated. A simulator for the hydrologic response of any encoded channel network has been designed and implemented in FORTRAN. The network is represented by a binary tree structure within which the topologic connections, geometric and other attributes of its segments can be introduced, altered, and retrieved by a set of programmed functions. The comprehensive computer package can model either the behavior of existing drainage systems or the expected performance changes from modification of drainage systems. The simple, yet detailed distributed model has the potential of revealing worst-case velocities or patterns for moving storms. The model has been applied to an existing drainage system, simulating both the runoff at any point and the cumulative behavior in relation to a given storm description. (Bell-Cornell)
W74-04852

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, and J. Sellers.
Available from National Technical Information Service as PB-228 588 $11.50 in paper copy, $1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta, Report ERC-0773, June 1973. 155 p, 5 fig, 16 tab, 189 ref, 2 append. OWRR A-040-GA(2). 14-31-0001-3810.

Descriptors: *Evaluation, *Project feasibility, *River basin development, *Cost benefit analysis, *Social aspects, *Economic feasibility, Project planning, Water control, *Appalachian Mountain Region, Alternative costs, Flood control, Water quality, Tennessee Valley Authority, North Carolina.
Identifiers: Upper French Broad River basin(N.C.), Multiple objective planning.

A methodological and pragmatic basis is presented from which to measure and evaluate future river basin development projects within the framework of multiobjective principles and standards. The Upper French Board River Basin and a proposed 14-reservoir TVA project within the basin were selected for a case study of traditional benefit-cost analysis and subsequent multiple-objective comparisons with the national economic development, environmental, social, and regional economic development analyses. The areas of economic theory and public finance were integrated with the environmental aspects to develop a systematic process for evaluation of benefits and costs considering resources displaced as well as environmental and social costs imposed. The benefits claimed and views held for public investments in water resources by various interest groups were explored for the region. No significant relationship between the presence of water resources projects and economic activity was found for a region in which water resources is not the limiting factor in the economic mix. Specific methodological and field level improvements are suggested for future water resources project evaluation to insure consideration of the complete range of alternative solutions to flood control, recreation, water supply and other problems while minimizing adverse economic, environmental, and social impacts.
W74-04854

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr., and N. X. Tsiourtis.
Available from National Technical Information Service as PB-228 606 $9.75 in paper copy, $1.45 in microfiche. Missouri Water Resources Center Completion Report, July 1973, 122 p, 37 fig, 8 tab, 9 ref, 2 append. OWRR B-065-MO(1). 14-31-0001-3607.

Descriptors: *Flood control, *Probability, *Linear programming, *Optimization, *Reservoir operation, *Reservoir releases, Time series analysis, Computer program, Hydrographs.
Identifiers: *Kansas River basin.

Probabilistic methods of hydrology and optimization techniques were used to determine an optimal sequence of releases from a system of reservoirs during a flood emergency. The operation schedule for a reservoir was determined from estimated inflow to the reservoir, current reservoir contents and downstream conditions. Linear programming was used to establish the optimal operating procedure. The duration of the flood producing storm was divided into a series of equal time increments, an inflow into each reservoir estimated for each time increment and a release made from each reservoir during each time increment. The objective function (to be maximized) was taken to be the sum of all reservoir releases during the duration of flood inflow to the reservoirs.
W74-04858

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Paper presented at 54th Annual Meeting of American Geophysical Union, April 16-20, 1973, Washington, D.C. 20 p, 5 fig, 10 ref. OWRR B-032-ARIZ(4).

Descriptors: *Snowmelt, *Runoff forecasting, *Reservoir operation, *Statistical models, *Stochastic processes, Melting, Temperature, Rainfall, Snowpacks, Water equivalent.

A methodology is given to forecast snowmelt to allow managers of water resources systems to regulate reservoir releases to minimize expected losses. Using an event-based precipitation model, a distribution function of water available for runoff is obtained. The amount of water available for runoff is the sum of the water equivalent of snow on the ground at the time the forecast is made, and the predicted amount of precipitation during the forecast period. A melt coefficient, a random variable, is a function of predicted temperature. The distribution function of snowmelt runoff is the product of the two random variables involving the predicted precipitation and temperature. A one-period objective function is defined to determine a reservoir release rate which would minimize expected losses. (Knapp-USGS)
W74-04918

HYDROLOGIC CHARACTERISTICS OF ALDER CREEK, IRON COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
B. K. Holmstrom, W. A. Gebert, and R. G. Borman.
Open-file report, June 1973. 10 p, 9 fig, 8 tab, 6 ref.

Descriptors: *Streamflow, *Sedimentation, *Wisconsin, *Reservoirs, Floods, Peak discharge, Low flow, Sediment yield, Hydrologic data, *Pre-impoundment.
Identifiers: Alder Creek(Wisc).

The hydrologic characteristics of Alder Creek, Iron County, Wisconsin, were studied so that water-resource planners could evaluate a reservoir site. The hydrologic characteristics estimated were the mean flows, low flows, flood peaks, suspended-sediment discharge, and depth to bedrock. Also included is an estimate of the time required to fill the proposed reservoir. The probable maximum flood (PMF) at the damsite of the proposed reservoir has a peak of 41,000 cfs and a 24-hour volume of 19,700 acre-feet. A full reservoir reduces the time of concentration of storm runoff, which results in a higher peak discharge than under preimpoundment conditions. The estimated filling times ranged from 18 months for an elevation of 1,410 feet to 76 months for an elevation of 1,430 feet. Sediment deposition was estimated to be 220 tons per year. (Knapp-USGS)
W74-04920

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
M. D. White.
Available from the National Technical Information Service as PB-229 087, $4.50 in paper copy, $1.45 in microfiche. Technical Report 64, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., May 1973. 24 p. OWRR A-027-NY(3). 14-01-0001-1852.

Descriptors: *Water supply, Water resources, *Water transfer, *Interstate, *Water law, *State jurisdiction, *Percolating water, Federal jurisdiction, New York, Regulation, Water pollution control, Groundwater.
Identifiers: Property rights.

Recently, Federal and State agencies have instituted water management and programs to prevent and/or clean up water pollution for purposes of maintaining the availability of adequate water supplies. Significant problems in water supply, however, result in transferring quantities of water between states. In view of the present national water crisis, Federal government regulation of interstate water transfer is often advocated. But in the absence of Federal action, the states must protect and manage their own groundwater resources. States can protect their percolating water resources only by valid conservation laws, not by antiexport statutes which discriminate against out-of-state users. (Bell-Cornell)
W74-04980

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
July 1972. 19 p, 6 plates, 2 tab, 4 append.

Descriptors: *Levees, *Flood control, *Sumps, *Institutional constraints, *Project planning, Flood protection, Drainage, Pumping, Drainage programs, Cost-benefit analysis, Project purposes, Channel improvement, Hydraulics, Environmental effects, Recreation, *Tennessee.
Identifiers: *Urban renewal, Gravity outlets, Dyersburg(Tenn), North Fork, Forked Deer River(Tenn), Environmental impact.

The purpose of the project is to provide flood protection to the southwestern sector of Dyersburg, Tennessee, north of the North Fork, Forked Deer River. The area, adjacent to th central business district, contains both commercial and residential land uses, as well as being the site for an urban renewal program under the Department of Housing and Development. Plans were formulated with a primary objective of providing the 50 and 100 year flood protection requirements of the Federal Housing Administration for the urban renewal area. Construction of a levee is proposed. This necessitates provisions for interior drainage of the area. Drainage is primarily through two small channels tributary to the Forked Deer River. Several project features are designed to provide protection for all interior areas above elevation 269 feet mean sea level: (1) gravity outlets, which will discharge runoff through culverts under the levee; (2) excavated sump on the landside of the levee to provide approximately 148 acre feet for storage of interior runoff; (3) pumping station and outlet structure, when the excavated sump does not provide sufficient storage; and (4) interior channeling to transition flows into the excavated sump. A cost-benefit analysis is included. (Hoffman-North Carolina)
W74-04989

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Sanford, North Carolina. June, 1973. 24 p, 10 fig, 5 tab, 22 plates.

Descriptors: *Flood data, *Peak discharge, *Overflow, *Flood plains, Flood recurrence, Maximum probable flood, Flood profiles, Flood damage, Hydrograph analysis, Streams, *North Carolina.
Identifiers: *Big Buffalo Creek(N.C.), Little Buffalo Creek, Sanford(N.C.), Intermediate Regional Flood, Standard Project Flood.

Areas of Sanford subject to flooding from Big Buffalo Creek between McNeil Road and Wicker Steet Extension (3.11 miles), and from Little Buffalo Creek, between Northview Road and Rose Street (4.6 miles) are identified. Total drainage area of Big Buffalo Creek is 20.8 square miles; while the total drainage area of Little Buffalo Creek is 11.5 square miles. Property within flood plains, primarily residential and commercial, has been damaged by previous floods in 1945, 1952, and 1954. Development of the extensive open spaces along the creeks, expected with the expansion of the City of Sanford, would increase the severity of flood damage. Flood impact assessments are based upon estimated peak flows of the Intermediate Regional Flood, defined as one that could occur once in 100 years on the average, and the Standard Project Flood, defined as a major flood culminating from a severe combination of meterological and hydrological conditions. Peak discharges are given for selected locations. For Big Buffalo Creek at McNeil Road, peak discharges are estimated at 6,400 cubic feet per second for the Intermediate Region Flood and at 12,340 cubic feet per second for the Standard Project Flood. For Little Buffalo Creek at Northview Road, peak discharges are estimated at 2,600 cubic feet per second for the Intermediate Regional Flood and at 5,170 cubic feet per second for the Standard Project Flood. Discharge hydrographs are included. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are graphed. Overflow limits for both Big Buffalo Creek and Little Buffalo Creek are detailed on contour maps. (Hoffman-North Carolina)
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Roanoke Rapids and the Town of Weldon. June, 1973. 34 p, 10 fig, 7 tab, 16 plates, glossary.

Descriptors: Floods, *Flood data, *Flood profiles, Flooding, *Flood frequency, Flood damage, Flood control, Flood plain zoning, Flood plain, Historic floods, *North Carolina, Land use, Flood recurrence interval, Maximum probable flood.
Identifiers: Roanoke River(N.C), Chocoyotte Creek(N.C.), Roanoke Rapids(N.C.), Intermediate Regional Flood(IRF), Standard Project Flood(SPF), Weldon(N.C.).

Flooding from Roanoke River and Chocoyotte Creek has severely damaged the towns of Roanoke Rapids and Weldon in 1912, 1940, 1944, and 1945. To aid flood plain utilization and flood damage reduction, areas subject to possible future floods are identified. Factors affecting the flood intensity in these areas include floodflow obstruction, floodflow reduction measures, evacuation plans, and material storage on the flood plain. The Intermediate Regional Flood (IRF) is defined as a flood that could occur once in 100 years, while the Standard Project Flood (SPF) is a major flood expected to occur from the most severe meteorological and hydrological conditions. The extent of flooding, velocity of flow, and rates of rise and duration of flooding are calculated for both bodies of water and types of floods. Floods on the Roanoke River are characterized by slow rates of rise and long duration above flood stage, while floods on Chocoyotte Creek rise to a peak quickly, but with shorter duration. Areas covered by both flood types would be extensive and include commercial, industrial, and residential areas, but due to wider extent, greater depth of water, higher velocity of flow, and longer duration of flooding, damage Standard Project Floods is more severe than during Intermediate Regional Floods. (Grden-North Carolina)
W74-04994

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
H. A. W. Morrice, and W. N. Allan.
Proceedings, Institution of Civil Engineers, Vol 14, p 101-156, October, 1959 18 fig, 13 tab.

Descriptors: *Computer models, *Irrigation, *River forecasting, River basin development, Planning, *Simulation analysis, River regulation.
Identifiers: *Nile River Valley Plan.

Computer simulation was used to determine the best way to control the Nile River and its tributaries in order to maximize water available for irrigation. Possible sites for control works on the Nile and its tributaries were identified, and working arrangements between them specified. These then took the form of algebraic control equations. Assumed quantities of water to be abstracted at various points in the Sudan and at Aswan in Egypt were stated as proportions of the net volume available. River behavior between 1905 and 1952 was used in the analysis. Time lags, transmission and evaporation losses, and the initial content of reservoirs were taken into account. Flow diagrams summarize the logic. The final result, the Nile River Valley Plan, is the product of successive improvements in the control equation. It gives maxima and minima for reservoir contents and controlled discharges, evaporation losses, benefits from certain conservation works, volumes of water available for irrigation, and figures for hydro-electric power. (Hoffman-North Carolina)
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
M. Borlin.
Organization for Economic Cooperation and Development, Paris. Series: Problems of Development. 1971. 94 p, 5 fig, 9 tab, 86 ref, 2 append.

Descriptors: *River basin development, *Simulation analysis, *Econometrics, Benefit-cost analysis, Forecasting, Decision-making, Methodology, *Alternative planning.

A simulation model that would enable the policymaker to analyze the effects of alternative river basin development schemes on target variables, such as total population, employment rate, and income per head of household is presented. Final selection of the best development project can then be determined by cost-benefit analysis. The model attempts to internalize as many variables as possible, so that the model is nearly closed. It is modular in form, with submodels being concerned with the agricultural sector, the demographic sector, the employment sector, the income sector, and the water sector. The river basin is divided into subregions. Although the model of each subregion incorporates all the different subsectors, the subregions themselves are only linked through the water subsector. The water outflow of the upstream subregion is the inflow of the downstream subregion. The model is dynamic in that it includes explicit feedbacks, loops, delays, and time-relate variables. Results are given year by year. (Hoffman-North Carolina)
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
M. Klasema.
Planning and Development in the Netherlands, Vol 4, No 1, p 8-27, 1970. 8 fig, 5 photos.

Descriptors: *Water management(Applied), *Reclamation, *Land reclamation, *Water quality, *Salinity, Land management, Flood control, Dikes, Lakes, Water, Reservoirs, Drainage systems, Water level, Sluices, Water demand, Water policy, Water supply, Sea water.
Identifiers: *Netherlands(Zuiderzee), Act for Enclosure and Partial Reclamation of the Zuiderzee, North Sea, Polders.

Water management has played an importent role in the Netherlands way of life. As early as the twelfth century, the Dutch built dikes to discourage flooding. However, it was not until the nineteenth century that technology provided the tools for reclaiming polders from the sea. A plan suggested fifty years ago by engineer Cornelis Lely forms the basis of the Act for the Enclosure and Partial Reclamation of the Zuiderzee. It specified separating the Zuiderzee from the North Sea with a closed dike, laying out polders around the Zuiderzee, and maintaining large fresh water basins within the enclosure. Border lakes are now being created between the polders and the mainland. These lakes are divided into reservoirs to improve the quality and level regulation of the water. Water quality, especially with regard to salt content, is important since the water washes through the reservoirs and is used for irrigation and for consumption. Such reservoirs also serve as a safeguard for water quality in the event of calamity in the enclosure. In the future, the water supply of the Netherlands may be centralized, using the Zuiderzee area as the largest source of storage. (Grden-North Carolina)
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
L. Wijers.
Planning and Development in the Netherlands, Vol 4, No 1, p 42-61, 1970. 26 fig.

Descriptors: Reclamation, *Land reclamation, *Optimum development plans, *Comprehensive planning, *Area redevelopment, *Water control, *Land farming, Drainage systems, Sea water, Land use, Urbanization, Long-term planning, Gulfs, Land management, Vegetation establishment, Regional economics, Dikes.
Identifiers: *Netherlands(Zuiderzee), Landscape development, Open plan, Polders, Conurbation, Wieringermeer(Neth), Noordoostpolder(Neth), Oostelijk Flevoland(Neth), Zuidelijk Flevoland(Neth), Markerwaard(Neth).

The reclamation from the sea of the Netherlands' Zuiderzee area adds one-fifth of the country's total surface and shortens the distance between the northern and western parts by one-third. Four polders have been reclaimed sequentially since 1930, with the fifth to be ready by 1980. Through this time sequence, each polder acquires a function determined by the social and economic conditions at its construction time. Using knowledge obtained with each previous polder, State authorities lay dry polders with regard for an optimum physical plan. For example, the recently reclaimed polders provide additional space for urbanization. While plans to build a given number of villages in each polder were drawn up, most were modified by unpredictable conditions. Modifications included reduction in number of villages created, erection of service centers and shifting of agricultural areas. Thereefore, an 'open plan,' concerned with structure, or 'the way in which the parts are arranged with respect to one another' is used. The plan is not static, and while each part will develop a distinct form, this form will not inhibit future development. Course of development is more important than pinpointing the future. Coordination and communication among those dealing with physical planning is also essential for planning a well balanced environment. (Grden-North Carolina)
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
H. Smits.
Planning and Development in the Netherlands, Vol 4, No 1, p 62-78, 1970. 9 photos, 1 tab.

Descriptors: *Agriculture, *Reclamation, *Land reclamation, Land management, *Farm management, Dikes, Canals, Vegetation establishment, Drainage systems, Crops, Evaporation, Permeability, Land use, Soil management, Soil structure, Soil structure, Soil environment.
Identifiers: *Netherlands(Ijsselmeer polders), Block parcelling system, Soil mapping, Lease holding, Tenant farmers, Cooperative farmers, Land allotment, Marine soils, Agricultural Holding Act, Ministry of Agriculture and Fisheries(Neth).

The agricultural aspects of reclaiming the IJsselmeer polders in the Netherlands are integrated with the drainage process of the polder. A dike is erected, and pumping stations are installed. Reeds are sown to promote evaporation. Over a ten-year period, networks for water channels and roads are laid out, subdividing the land into tracts. Optimum lot size is determined by costs of land use and layout. Reclamation begins two to twelve years later with destruction of reed vegetation and preparation of the soil for sowing. The State then farms the land for five years. During this period, soil is improved, farm dwellings are constructed, and electric and telephone cables are installed. Later, the agricultural destination of the land is determined to be grassland farming, arable farming, mixed farming, fruit growing, or horticulture, depending on the soil profile. Land is then allocated to private enterprises of one to four workers. Size of enterprises have been increasing as technical potential and wages have risen. Enterprises growing vegetables and flower bulbs vary in size from 7.4 to 19.7 acres, fruit growing farms from 14.8 to 37 acres. Land is leased for a term of years or on a perpetual long lease. Enterprises may be sold outright in the future. The relationship between gross yield and costs causes reasonable income to be earned. While farmers may manage their lands as they desire, cooperation between enterprises exists with respect to large farming implements and fertilizers. Financial matters are handled mainly by cooperative farmers loan banks. (Grden-North Carolina)
W74-05002

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 6B.
W74-05003

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2J.
W74-05033

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
W. P. Stokes.
Journal of Petroleum Technology, Vol 23, No 10, p 1209-1214, October 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Arctic, *Cold regions, Construction, *Road construction, *Alaska, Permafrost, Foundations, Drainage, Thawing, Snow, Wind pressure, Gravels, Piles(Foundation), Buildings, Ice.
Identifiers: *North Slope(Alas), Prudhoe Bay(Alas), Sag River(Alas).

The North Slope of Alaska is located in a continuous permafrost zone where the subsurface soils are permanently frozen to depths as great as 2000 feet. The top foot or so of soil - called the active layer - thaws in summer and refreezes in winter. Permanent road construction requires that the road be built in such manner that the insulating tundra cover is preserved intact and undamaged. Consequently, surface grading and side ditching are ruled out. Culverts are installed above the tundra surface. Adequate quantities of gravel are available in the vicinity of Prudhoe Bay. The gravel should be fairly well graded with sufficient fines to act as a binder; yet it must contain less than 3 percent of material finer than 0.02 mm. A 5-ft.-thick gravel fill usually is adequate, although a somewhat thicker layer may be needed to prevent the thaw from extending into the active zone. Buildings, structures, and other facilities must be designed to meet government regulations and operational requirements. Local conditions of wind velocity and snowfall must be considered. Permanent, heated structures are supported on pile foundations with several feet of free air space under the building. Drill sites are covered with a 5-foot layer of gravel. Skid-mounted rigs are used and the skid rails are supported on timbers to allow circulation of air under the drilling rig. All utility lines that are subject to freezing are protected by insulation, heat tracing, or are placed in heated utilidors. (Gray-NWWA)
W74-05104

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, T.N. Makarevich, editor, Leningrad, 1972. 128 p.

Descriptors: *Hydrology, *Meteorology, *Forecasting, River forecasting, Streamflow forecasting, Flood forecasting, Flood routing, Hydrograph analysis, Discharge(Water), Runoff, Inflow, Reservoirs, Precipitation(Atmospheric), Atmosphere, Air circulation, Temperature, Ice, Seasonal, Correlation analysis, Equations.
Identifiers: *USSR, Heat exchange, Traveltime, Hydrometric stations.

Development of river-forecasting procedures is examined in this collection of 9 papers published by the State Hydrologic Institute in Leningrad. Methods are presented for preparation of long-range forecasts of duration of ice phenomena on the Danube River, severity of winters in Central Europe, maximum ice-jam levels of the Severnaya

Dvina River at Arkhangel'sk, maximum flood levels of the Dniester River, and of storm runoff based on precipitation for the Dnieper River. Procedures are described for estimating inflow to reservoirs and for using precipitation data in the preparation of operational forecasts. (See W74-05142 thru W74-05145) (Josefson-USGS)
W74-05141

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05142

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05144

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. V. Ardasheva, and R. A. Nezhikhovskiy.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 84-96, Leningrad, 1972. 3 fig. 5 tab, 10 ref.

Descriptors: *Water levels, *Flood forecasting, Flood routing, Channels, Discharge(Water), Flood discharge, Flood waves, Flood peak, Hydrographs, Hydrograph analysis, Inflow, Equations.
Identifiers: *USSR(Dniester River), Traveltime, Hydrometric stations.

To prepare a forecast of maximum flood levels on the Dniester River at Mogilev-Podol'skiy, Soroki, and Kamenka, a precomputed relation was established between these levels and corresponding maximum stream discharges. The forecast is timed to coincide with the onset of the flood peak at Galich and can be made 3-4 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05145

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
R. Cetik.
In: Agricultural spects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p. 109-128. 6 fig, 2 tab.

Descriptors: *Vegetation, *Arid climates, *Arid lands, Geomorphology, Grasslands, Orography, Rain, Rainfall, Temperature, Evaporation, Winds, Precipitation(Atmospheric), Rainfall disposition, Snowfall, Plant groupings, Shribs, Riparian plants, Grazing, Grasses.
Identifiers: *Turkey(Anatolia).

The geomorphology of central Anatolia is described as being diverse, with some mountainous regions and intermountain plains. These plains have an arid climate, caused by the deflection of the moisture-bearing winds of Western Anatolia by the surrounding mountains. Temperature distribution in the area is fairly uniform, with significant low temperature extremes in winter and corresponding high temperature extremes in summer months. Winds are associated with annual cycles, often with two predominant directions. Evaporative water loss from the area is found to be from three to four times in excess of the local precipitation. Central Anatolia has a cold and snowy winter, a mild and rainy spring, a less rainy autumn, and a hot and dry summer with a severe arid period. These climatic conditions are mainly responsible for the floral and vegetation of the central plains. Vegetation may be roughly grouped into classes associated with valleys and the steppe. The more moist environment of the valleys lends itself to shrub vegetation, which is thoroughly cataloged, as is the grassland vegetation of the drier steppe. (Muller-Arizona)
W74-05214

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W74-05226

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-05335

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
V. D. Zelikov.
Sb Rab Mosk Lesotekh Inst. 33, p 113-130. 1970.
Identifiers: Ages, *Forests, Moisture, Porosity, Reserves, *Sod podzolic soils, *Spruce, Water regime, Weather, *USSR(Moscow region).

A survey is presented of the mensurative characteristics of spruce stands, soil morphology and weather conditions on the spruce forests in the Moscow region, USSR. The dynamics of replenishment of groundwaters and of the moisture reserves in the soil under the spruce forests, the characteristics of moisture circulation, the dynamics of moisture available to the plants during the growth period, and the changes of soil porosity under spruce forests of different ages are described.--Copyright 1973, Biological Abstracts, Inc.
W74-05343

THE EFFECT OF METEOROLOGICAL FACTORS ON COMBUSTIBILITY OF GROUND COVER AND A NEW METHOD OF FORECASTING FIRE DANGER IN FORESTS OF THE KAZAKH HILLS (IN RUSSIAN),
M. Z. Musin.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 309-314, 1970.
Identifiers: *Combustibility, *Fire danger, Forecasting, *Forests, Grass, Ground cover, Hills, Humidity, Meteorological studies, Pine, Temperature, *USSR(Kazakh Hills).

Investigations were made on the effect of precipitation, temperature, relative humidity, and wind velocity on the humidity and combustibility of the ground cover of dying-off needles in pine forests (site class V, age class VI, density 0.5) on a glade with grass cover. The effect of each factor is evaluated by a 3-mark scale. The complex effect of meteorological factors and the appearance of fire sources on the territory under guard are also evaluated by 3-mark scales. Results are presented of experimental verification of different methods of determination of fire danger under the conditions of the Kazakh Hills, USSR.--Copyright 1973, Biological Abstracts, Inc.
W74-05352

DENSE LOCAL PLANTATIONS OF PINES IN THE NORTHERN KAZAKHSTAN (IN RUSSIAN),
V. A. Dikorov.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 213-223, 1970.
Identifiers: Moisture, Nutrition, *Pines, Plantations, *USSR(Kazakhstan).

Studies were conducted on pine plantations established in 1939-1962 by seed sowing and seedling planting on small plots from 0.2-0.3 x 0.2-0.3 to 3 x 3 m on dry stony soils of the hillocky area and clearings turned into steppe in the Kustanai, Tselinograd and Kokchetav (USSR) regions. Dense plantations, established by sowing were most practical in places requiring much clearing. Nutrition and moisture reserves were utilized by the biological group (stands) more completely than by single trees. With age, the growth of pine in dense biological groups weakened. Optimum density was 3-5 trees/m2 in a dry pine forest. The spacing of plots at distances of 3 x 5, 5 x 5, 4 x 8 m did not result in a stable biocenosis; the size of the plots should not exceed 1 m2, the optimum size being 0.5 x 0.5 m with 1000 plots/ha. Natural root grafting in the biological groups was a frequent phenomenon but it did not affect tree growth.--Copyright 1973, Biological Abstracts, Inc.
W74-05354

STUDIES ON RECLAMATION DIKE AT RIVER MOUTH: METHOD OF FORECASTING DISASTER OCCURRENCE AT LAND RECLAMATION BY MEANS OF ESTIMATING INFLUENCE OF SHAPE OF DIKE AND CONFIGURATION SURROUNDING LAND RECLAMATION AREA (IN JAPANESE),
T. Kusaka, T. Fujiwara, and H. Masumoto.
Bull Fac Agric Yamaguti Univ. 23. p 483-498, 1972, Illus, English summary.
Identifiers: Configuration, Dikes, *Disaster forecasting, *Japan, *Land reclamation, Methodology, *Reclamation dikes, Rivers.

Some land reclamation areas studied in Japan were Saga, Kagoshima, Kumamoto, Yamaguchi, Shimane, Tottori and Ibaragi prefectures.--Copyright 1973, Biological Abstracts, Inc.
W74-05355

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
For primary bibliographic entry see Field 8A.
W74-05383

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
J. E. Keith, J. C. Anderson, and C. G. Clyde.
PRWG100-3, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, June 1973. 51 fig, 16 tab, 40 ref, 5 append, 136 p.

Descriptors: *Water supply development, *Economic efficiency, *Inter-basin transfers, *Water allocation(Policy), *Utah, *Agriculture, *Water demand, Computer models, Optimization, Linear programming, Marginal costs, Value, Municipal water, Industrial water, Wetlands, Water requirements, Systems analysis.

Identifiers: *Central Utah Project, Jordan River Basin(Utah).

The efficient allocations of agricultural water in Utah in time frames up to 2020 under several alternative assumptions are examined, and the costs of alternative policies are calculated. Using mathematical programming techniques, a computer model is developed to determine the supply (marginal cost) and demand (value of marginal product) relationships for agricultural water, given depletions for municipal and industrial (M and I) and wetland requirements. The model maximizes net profit per acre to an average agriculturalist in each of ten study areas in Utah. Proposed interbasin transfers and their costs are included in supply. The optimal solution generated is an efficient allocation, since maximization of net profits occurs only when value of marginal product equals marginal cost. Requirements for M and I water are projected into the future, using trending and probable industrial development. Timing of investments in water distribution systems can be determined from the model solutions. Using alternative assumptions about policies, several optional temporal distributions are determined. The effect of restrictions on groundwater pumping is examined. Costs to users in higher supply curves (marginal costs) are approximated by areas between supply curves. Losses to agricultural users from diminished efficient new production can be approximated. The critical factors in large proposed water transfers in Utah appear to be the growth of M and I requirements along the Wasatch Front, particularly in the Jordan River Basin. (Bell-Cornell)
W74-05385

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
R. G. Cembrowicz.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 157-179 (Chapter 7), 1973. 1 fig, 2 tab, 51 equ, 30 ref.

Descriptors: *Water supply development, Projects, *Design, *Optimization, *Alternative planning, *Mathematical models, Cost-benefit analysis, Linear programming, Networks, Hydraulics, Water distribution(Applied), Water treatment, Systems analysis.
Identifiers: *Cost minimization, Geometric programming, Nonlinear programming, Capacity expansion, Unit processes, Tree networks, Decomposition techniques.

The optimal design of water supply systems is considered, with several specific parts of the overall water supply system treated in detail. Inherent difficulties exist in comparing costs of water supply systems to the benefits of ample and safe supply; the problem of a cost-benefit analysis for water supply projects is discussed. Next, if fresh water is scarce or water demands exceed accessible resources, an investigation of all possible supply alternatives in an entire region becomes necessary. Mathematical programming techniques for selecting different sources and the least-cost combination of alternate sources are considered. Next, the focus is on the optimization of unit processes in a water treatment plant; geometric programming is introduced and applied to the hydraulic design of sedimentation tanks. Then, the economically optimal design of the water distribution system is investigated; discussed is the tree principle, and the transformation of the nonconvex capital cost function of a hydraulic network to subsets of nonlinear convex functions by a decomposition position principle from graph theory is described. Finally, a model for the capacity expansion of a water supply system is presented. (Bell-Cornell)
W74-05394

4B. Groundwater Management

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, R. A. Young, and G. E. Radosevich.
Available from National Technical Information Service as PB-228 649 $7.50 in paper copy, $1.45 in microfiche. Colorado State University Environmental Resources Center, Completion Report Series No 53, August 1973, 81 p, 3 fig, 3 tab, 53 ref. OWRR B-076-COLO(2).

Descriptors: Groundwater, *Surface-groundwater relationships, *Regulations, Law, *Optimization, *Water management(Applied), *Conjunctive use.

The purpose is to model the legal restrictions and the hydrologic constraints imposed by conjunctive use, and develop criteria for legal rules that utilize information on aquifer parameters, snowmelt runoff, etc. Legal and institutional methods and limitations concerning the conjunctive and integrated use of ground and surface water resources are examined. Legal schemes developed by the states of Colorado and New Mexico for conjunctive use are discussed, together with a cursory examination of the situations in Texas and California. The doctrine of prior appropriation is discussed in relation to its initial development in the western states for the purpose of controlling the appropriation of surface water to its evolution and modification to control conjunctive use. The Colorado system places more stress upon the concept of establishing some common basis for surface and groundwater rights while the New Mexico procedure makes the existence of one dependent upon the retirement of the other. Both systems are characterized by a singular absence of specific requirements; instead broad regulatory powers are created. California has devised a different solution to integrated use due to its complex dual system of water rights. Texas will be faced with a highly complex situation due to adherence to the English rule that a landowner owns the water under his land and cannot be denied the right to produce his groundwater even if it infringes upon neighboring rights. Western states are finally recognizing the need for integrated use of ground and surface water; the Fellhauer case required the integration of vested rights with maximum utilization.
W74-04853

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
K. E. Vanlier, R. C. Christensen, R. J. Faust, and W. F. Harris, Jr.
In: Geological Survey of Alabama Atlas Series 1, p 13-28, 1971. 13 ref.

Descriptors: *Water resources, *Alabama, Groundwater, Surface waters, Urbanization, Karst hydrology, Water demand, Water supply, Geology, Maps.
Identifiers: *Huntsville(Ala).

The demands of the increased population upon the natural resources of Madison County, Alabama, are at an all-time high; so is the volume of waste produced. Informed use of the land, water, and mineral resources, based on scientific facts, is necessary for Alabama's third-largest urban area and its environs. This study has been directed at supplying basic facts about the resources of the area and their conservation to aid in adequate city and urban planning for the future. Water, oil and gas and minerals such as limestone, sand, gravel, and clay for construction are the most important raw materials for industrial development in the area. In general, Alabama has great and unexplored reserves of these resources that are relatively undeveloped. In Madison County, a thick sequence of limestone beds underlie the area. Some of these formations are relatively pure limestone that has been gently folded and fractured. Fracture openings in limestones are enlarged by solution, forming large storage reservoirs underground for water and an extensive labyrinth of channels along which groundwater can move. These groundwater reservoirs, when tapped effectively by wells and managed properly, are capable of supplying many billions of gallons of water to the area to meet its water needs. Wells are an important source of water supply. The yields from these wells range from about 5 to more than 100 gpm. Most wells in the quadrangle supply household needs, which require only a few gallons per minute. Several wells yielding 100 gpm or more are used for industrial, agricultural, and public supply. (Knapp-USGS)
W74-04911

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
E. S. Davidson.
Arizona Water Commission Bulletin 6, December 1973. 40 p, 4 fig, 2 tab, 17 ref.

Descriptors: *Water resources, *Arizona, *Groundwater, *Surface waters, Alluvial channels, Hydrologic data, Hydrogeology, Aquifers, Water yield.
Identifiers: *Big Sandy River(Ariz).

The central valley of the Big Sandy River, Arizona, is underlain by several hundred to a few thousand feet of semiconsolidated to unconsolidated deposits that store large amounts of groundwater; the principal water-yielding units are stream and flood-plain alluvium, the upper basin fill, the lower basin fill, and the arkosic gravel. The depth to groundwater below the land surface ranges from less than 1 foot in places along the Big Sandy River to 750 feet in the northern part of the area. The mean annual precipitation ranges from 10 inches in the central valley to 20 inches in the mountains and is equivalent to about 1 million acre-feet of water in the 1,770-square-mile drainage basin of the Big Sandy River upstream from the granite gorge near Wikieup. About 4.6% of the precipitation leaves the area as surface-water and groundwater outflow; the rest of the precipitation is lost to evaporation or is transpired by vegetation. In general streamflow is intermittent and occurs only in response to precipitation or snowmelt. Groundwater and surface water generally are of good chemical quality except for the high fluoride content. The average surface-water outflow is about 24,900 acre-feet per year. The total groundwater outflow--which comprises evapotranspiration in an area of dense riparian growth, consumptive use for irrigation and public supply, and underflow--is about 21,500 acre-feet per year. Only a few thousand acre-feet of water per year is used by the inhabitants in the area, and the available water resources will support considerable additional development. (Knapp-USGS)
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. S. Gates.

Available from the National Technical Information Service as PB-228 854, $15.00 in paper copy, $1.45 in microfiche. Technical Report No. 8, June 1972. 214 p, 11 fig, 16 tab, 40 ref, append. OWRR B-007-ARIZ(26) and A-010-ARIZ(22). 14-01-0001-1876, 14-31-0001-3708.

Descriptors: *Groundwater, *Computer models, Recharge, Statistical models, *Forecasting, Network design, *Risks, *Well data, Pumping.
Identifiers: Bayesian decision theory, Groundwater pumping, Model evaluation, Uncertainty analysis.

The worth of additional data to a digital model of the Tucson basin, Arizona was computed using a basic form of statistical decision theory (Bayesian). The model variables for which additional data were hypothesized included the aquifer coefficients of storage and transmissivity, initial water levels, discharge, and recharge. The worth of data was evaluated in terms of the expected reduction in error in predicted water levels associated with collection of more data on one variable at one point in the model. A limited number of tests suggested that the Tucson basin model could be improved most by obtaining more data on discharge and recharge in areas where these variables were large, and by obtaining more data on transmissivity where it was uncertain. More data on initial water levels and storage coefficient commonly were less helpful. The sensitivity of the results to the assumptions made in postulating discrete frequency distributions with largely subjectively-determined parameters for the model variables was estimated. These tests indicated that the numerical values for worth of data were sensitive to the assumptions, but that the relative rankings of variables in terms of worth of added data remained constant.
W74-04975

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
S. Garza.
Texas Water Development Board, Report 34. November, 1966. 31 p, 11 fig, 4 tab, 33 ref.

Descriptors: *Aquifer characteristics, *Limestones, Surface-groundwater relationships, Water sources, Water table, Saline water intrusion, Reservoirs, Streams, Wells, *Texas.
Identifiers: *Edwards Aquifer(Tex.), *San Antonio(Tex.), Aquifer head-water movement relationships, Edwards Plateau(Tex.).

This report updates through 1964 hydrologic data on the Edwards and associated limestones, which is the principal ground-water reservoir (aquifer) for the San Antonio area. Records of precipitation, streamflow, and water level are included, as well as estimates of recharge to and discharge from the aquifer. The base flow of the streams that drain the Edwards Plateau is spring flow from a water-table aquifer in the plateau. Recharge is primarily from stream seepage, and through direct infiltration of precipitation on the outcrop of the aquifer. Between 1934-1964, average annual recharge was estimated to be almost 500,000 acre-feet. Most of the 1934-1964 discharge from the aquifer was from springs, exceeded by discharge from wells only between 1954-1957 and 1963-1964. In 1964 discharge from springs was nearly 214,00 acre-feet, while discharge from wells exceeded 267,000 acre-feet. Low water levels prevailed between 1947-1956, due to drought and increased withdrawals from wells throughout the San Antonio area. Recharge from heavy rains between 1957-1961 increased water levels to approximately pre-drought levels. Also included are analyses on the relation of the aquifer head to changes in water movement and storage and a summary of studies on water quality in the zone of transition between water of good quality and saline water in the aquifer. (Hoffman-North Carolina)
W74-04992

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 2F.
W74-05017

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
E. G. Woods.
Society of Petroleum Engineers Journal, Vol 10, No 3, p 245-256, September, 1970. 12 fig, 5 tab, 15 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Aquifer characteristics, *Mathematical models, Diffusivity, Drawdown, Flow Permeability, Porosity.
Identifiers: *Pulse test, *Well pair, *Two-zone reservoir, Cross flow, Skin factor, Buildup.

A mathematical study was undertaken to determine what errors could be caused by interpreting pulse tests in a multi-zone reservoir with a single-layer model. The investigation of the pressure response of two-zone reservoirs indicates the apparent transmissibility obtained by pulse testing is always equal to or greater than the total transmissibility of the zones. Apparent storage is always equal to or less than the total storage of the zones. These apparent zone properties approach total properties as vertical fluid communication between zones increases. The presence of non-uniform wellbore damage in the zones alters the division of flow between zones, and consequently, alters their apparent transmissibility ratio. The flow-rate ratio is a good estimator of the transmissibility ratio of the zone in the absence of wellbore damage. A numerical example is given of the use of a procedure, based on the differences of reservoir properties determined by single-well tests and pulse tests, to describe flow properties of two-zone reservoirs. (Gray-NWWA)
W74-05077

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
D. J. Swaine.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 5 p, 4 ref.

Descriptors: Groundwater, *Groundwater movement, *Geochemistry, *Trace elements, Chemical properties, Exploration, Mining, *Water quality, Salinity, Organic wastes, Solid wastes, *Sulfur bacteria, *Australia.
Identifiers: Perth(Aust.), Interstitial water.

The assumption is made that groundwater is a resource which will be used in increasingly large amounts in the future. There is at present insufficient knowledge of the trace-element composition; of the processes determining the composition; and of the causitive physical and chemical processes of underground waters. Discussed in some detail are: Origin of salts in groundwater, reactions between rocks and saline solutions, the relevance of underground waters to mineral exploration, and groundwater in the geochemical cycles of trace elements. Also discussed are processes which if operative could be instrumental in determining groundwater quality, such as the decomposition of organic matter and the action of sulphate-reducing bacteria. (Hunt-NWWA)
W74-05080

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 6E.
W74-05082

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
G. Jacobson, and C. H. Kidd.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 16 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Groundwater, *Aquifer characteristics, Water resources development, Springs, Wells, *Groundwater availability, Dug wells, *Water pollution sources.
Identifiers: *Papua New Guinea, Total dissolved solids, Bacterial contamination.

Groundwater makes a significant contribution to the urban and rural water supplies of Papua New Guinea. Eight hundred water bores and dugwells have been recorded, and there are spring developments throughout the country. Increased future usage of groundwater is necessary because of bacterial contamination of surface waters and the seasonal nature of the rainfall in some areas. Groundwater availability is largely unknown, and the need for reconnaissance surveys and detailed aquifer evaluations is discussed with the aid of a groundwater potential map. Finance is at present a major limiting factor to groundwater development, with government drilling programs appearing to be the only workable solution. (Staplin-NWWA)
W74-05084

PRESSURE INTERFERENCE EFFECTS WITHIN RESERVOIRS AND AQUIFERS,
Standard Oil Co. of California, San Francisco.
T. D. Mueller, and P. A. Witherspoon.
Journal of Petroleum Technology, Vol 17, No 4, p 471-474, April, 1965. 4 fig, 5 ref.

Descriptors: *Aquifers, Groundwater reservoirs, *Diffusivity, *Reservoirs, *Pressure, Flow, Head loss, Theis equation.
Identifiers: *Mortada equation, Point source, Well interference.

The solutions of Theis and of Mortada to the Calculation of pressure conditions within a reservoir or aquifer are reviewed. Graphs were prepared of dimensionless pressure drop vs. dimensionless time for radius ratios from one to infinity to afford solutions to the diffusivity equation for the infinite radial case at constant terminal rate. The Theis, or point source, solution can be used for radius ratios greater than 20, with little error (as shown by ex-

amples). For low radius ratios, the solution of the diffusivity equation given may be preferred. A chart provides a means of determining the order of the errors that will result through the use of the Theis equation. In the calculation of interference effects in an aquifer, a substantial error can occur when the Theis solution is used, although in oil-reservoir calculations the error is often negligible. (Gray-NWWA)
W74-05087

THE SKIN EFFECT IN PRODUCING WELLS,
For primary bibliographic entry see Field 8B.
W74-05088

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
W. S. Keys.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commision, p 46-73, 1973. 6 fig, 1 tab.

Descriptors: *Borehole geophysics, *Data collections, Hydrologic data, Hydrogeology, Electrical well logging, Radioactive well logging, Subsurface investigations.

Borehole geophysics or well logging includes all techniques of lowering a sensing device in a well to make a record which may be interpreted in terms of the rock characteristics, contained fluids, and the construction of the well. The single most important factor in the present minor use of geophysical logging in water wells in cost. As a result of recent developments in electronics, small and relatively inexpensive logging units that can be operated by one man are now available. A second basic deterrent to the widespread use of geophysical well logs in groundwater is that few professional geologists, hydrologists, or engineers are working on water well drilling projects. In addition, most drillers, municipal water engineers, or hydrologists do not have the experience necessary to interpret geophysical logs. Therefore interpretation must be provided along with logs, if logging is to have much practical application to the solution of hydrologic problems. (Knapp-USGS)
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
A. N. Turcan, Jr.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 18-28, 1973. 3 tab, 8 ref.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater managment.

In design and evaluation of a groundwater data system, thinking must not be limited to one part of the hydrologic system. The line between ground and surface water is indistinct; it is not a line, but a continuum that varies in relation to time and space. Groundwater becomes surface water and vice versa. The hydrologic system is dynamic, thus network design must be flexible and always subject to change based upon the changes in economy, available manpower, and new thrusts or problems, such as storage of waste in the deep zones as well as the shallow zones of the underground part of the system. (Knapp-USGS)
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
P. G. Mayer.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 12-17, 1973.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater management.

A local data base is needed for groundwater development as well as an appreciation of regional implications that may exist either as limiting to the desired engineering results or as an undesirable consequence of an engineering project. The usual purposes to which engineers and planners address themselves in connection with groundwater resources are water supply wells, infiltration galleries, groundwater recharging wells, and infiltration ponds. In larger industrial developments it may also be necessary to develop groundwater observation wells and groundwater monitoring systems, by means of which the fate of potential pollutants can be monitored and which, in the case of an unforeseen accident, provide the basis for remedial measures. (Knapp-USGS)
W74-05120

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
A. K. Bhar, H. S. Seth, and A. K. Ghosh.
Indian Geohydrology, Vol 9, No 1, p 19-30, June 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Water balance, *Groundwater, *Water yield, Irrigation water, Infiltration, Discharge(Water), Water resources development, Hydrogeology, Artesian aquifers, Water table.
Identifiers: *India(Tarai region).

In the groundwater of the Tarai region of India, every year a surplus of water accumulates in the upper unconfined aquifers, whereas the inflow to the confined aquifers just balances the outflow from them. This suggests that further exploitation of water from confined aquifers should be stopped at least for the time being, and additional water required for irrigation can be safely tapped from the unconfined aquifers. (Knapp-USGS)
W74-05131

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
N. T. Zhdankus.
Indian Geohydrology, Vol 9, No 1, p 1-9, June 1973. 2 fig, 4 ref.

Descriptors: *Water wells, *Water yield, *Hydrogeology, Economics, *Water costs, Hydraulic conductivity, Transmissivity, Data collections.
Identifiers: *India.

Optimum spacing and number of wells depend on hydrogeological conditions. Suitable methods for the determination of optimum spacing of shallow hard rock wells and selection of suitable pumps for them were developed on the basis of hydraulic and economical considerations. Shallow aquifers in hard rock areas of India are characterized by low hydraulic conductivity and transmissivity. Location of each well should be determined individually on the basis of geophysical data and interpretation of local topographical and geological conditions. Sharp variation of productivity of even closely situated wells in hard rock areas shows that hydrogeological parameters of such formations are inconsistent, varying within broad limits without any pronounced order. (Knapp-USGS)
W74-05133

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
February 1973. 44 p, 17 fig, 3 photo, 7 tab, 3 ref.

Descriptors: *Geothermal studies, *Water wells, Thermal water, *California, Thermal powerplants, Water yield, Wells.
Identifiers: *Geothermal energy, *Imperial Valley(Calif).

The Bureau of Reclamation and the Office of Saline Water are exploring the geothermal resources under Reclamation-withdrawn lands in Imperial Valley, California. A deep geothermal test well was drilled in Imperial Valley, California. Total depth of 8,030 feet was reached on August 16, 1972. The well began to flow geothermal liquid and steam on August 25, 1972 and flowed for an aggregate total of 66 days to January 24, 1973. A series of temperature, pressure, quality, and flow measurements were made during that period. Surface plumbing facilities, including a separator, silencer, and weir, were installed to separate the steam and liquid and to accurately determine the thermodynamic characteristics of the geothermal fluid. The water is typical geothermal fluid. It is predominantly sodium-potassium and chloride water, with the amount of silica being at the saturation point for the prevailing temperature. In the interval between 2,500-7,150 feet in Mesa 6-1, it would be possible to screen potential producing zones having intergranular permeabilities in excess of 100 millidarcys over an aggregate thickness of 1,232 feet. (Knapp-USGS)
W74-05139

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
Publication No 20, 1973. 58 p, 32 fig, 10 tab, 15 ref, 3 append.

Descriptors: *Conjunctive use, *Hydrogeology, Aquifer characteristics, Aquifer testing, Water yield, Drawdown, Surface-groundwater relationships, Water balance.
Identifiers: *Wales(Vale of Clwyd).

The hydrogeology of the Vale of Clwyd, Wales, and the relationship between the surface hydrology and groundwater conditions are described. Up to 20,000 cu m per day could be made available by continuous direct supply from boreholes, but any such perennial abstraction would in the long term reduce flows in the river Clwyd; at least 30,000 cu m per day could be made available for supply if the groundwater storage were to be used to regulate the river Clwyd, and such a development would enhance the low flows in summer and autumn over much of the river. (Knapp-USGS)
W74-05168

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
R. F. Norvitch, T. G. Ross, and A. Brietkrietz.
Metropolitan Council of the Twin Cities Area, St. Paul, 1973. 219 p, 59 fig, 27 tab, 64 ref, append.

Descriptors: *Groundwater, *Hydrogeology, Aquifer characteristics, *Minnesota, Hydrologic data, Aquifers, Water resources development, Cities, Water management(Applied), Water wells, Water yield, Urbanization.
Identifiers: *St. Paul(Minn), *Minneapolis(Minn).

The water resources of St. Paul and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the

metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropolitan area is pumped. The surface-water resources of the Twin Cities metropolitan area are used to such an extent that a supply adequate for domestic and industrial needs as well as powerplant and sanitary effluent assimilation will not be available during severe drought. Groundwater is obtained primarily from two aquifer systems: The Prairie du Chien-Jordan and the Mount Simon-Hinckley. In 1970, these aquifers supplied about 90% (175 mgd) of the groundwater used in the metropolitan part of the study area. The probable level of development that can be sustained by these two aquifers in the metropolitan area is estimated to be 1,100 mgd; thus, substantial additional groundwater supplied could be developed. However, considerable management and planning would be needed to sustain this level of development. Maps in this report can be used to select general well-field locations based on consideration of (1) aquifer, (2) depth needed for completion, (3) head availability, (4) location of natural recharge and discharge boundaries, and (5) distance from areas where over-development of groundwater resources is imminent. (Knapp-USGS)
W74-05172

SUBSURFACE BIOLOGICAL ACTIVITY IN RELATION TO GROUND WATER POLLUTION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W74-05230

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
M. A. Randal.
Bulletin 123, 1973. 141 p, 23 fig, 1 plate, 15 tab, 65 ref, 7 append.

Descriptors: *Groundwater, *Hydrogeology, *Australia, *Aquifers, Water yield, Geomorphology, Water quality, Groundwater movement.
Identifiers: Wiso Basin(Australia).

Groundwater resources were studied in the northern Wiso Basin in the central part of the Northern Territory of Australia. Because of seasonal and sparse rainfall the surface water resources of the region are meager, and both pastoral and community development are largely dependent on the availability of groundwater of reasonable quality. The region comprises three Palaeozoic basins of mainly carbonate rocks and their surrounding Lower Cambrian and Precambrian basement rocks. From a groundwater point of view the most important of the basement rocks are Lower Cambrian volcanics, which crop out in the west and extend subsurface considerable distances eastward. Most of the groundwater is obtained from the carbonate sequences. Over large parts of the region these sequences are overlain by flat-lying Lower Cretaceous rocks which have a profound effect on the groundwater regime. Geomorphology also is important to the groundwater regime. The region is a gently undulating plateau which slopes northward and is bounded by the dissected country of the main coastal river system; depth to economic quantities of water is governed by the depth below the surface of suitable aquifers, and throughout the plateau these are generally deeper than on its dissected margins. Throughout the entire region the known groundwater reserves are suitable for stock; only in a few places is the quality below domestic standards. The groundwater resources are more than adequate for the present pastoral and community development. Although rainfall is low in the southern parts the probable recharge areas are very large and the withdrawal rate is very low. In the north rainfall is high and recharge situations extensive. (Knapp-USGS)
W74-05331

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
K. R. Rushton.
Water Resources Bulletin, Vol 10, No 1, p 32-41, February 1974. 5 fig, 2 tab, 5 ref.

Descriptors: Water resources development, *Water yield, *Groundwater movement, *Numerical analysis, Drawdown, *Withdrawal, Mathematical models, Water table, Recharge, *Pumping.

Heavy pumping of an aquifer to remove a significant proportion of the stored water is considered using a numerical method which permits the analysis of radial flow to a well in an unconfined aquifer and allows for the reduction in the saturated depth. The analysis is restricted to extensive unconfined aquifers of constant thickness which are initially full of water with wells positioned on a square grid. When the aquifer is recharged with the recharge equaling the discharge, it is possible that a steady state will be reached with the heads remaining constant with time. Withdrawal of a large proportion of the available water from an unconfined aquifer requires carefully controlled pumping. If the discharge rate is too high, the pump will quickly run dry and only a very small proportion of the water will be withdrawn. (Knapp-USGS)
W74-05336

4C. Effects On Water Of Man'S Non-Water Activities

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 4A.
W74-05104

4D. Watershed Protection

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
Copy available from GPO Sup Doc as EP1.23:430/9-73-016, $2.20; microfiche from NTIS as PB-229 480 $1.45. Environmental Protection Agency, Washington, D.C., Office of Water Program Operations, Report EPA-430/9-73-016, July 1973. 205 p, 60 fig, 140 ref. EPA Contract 68-01-0755.

Descriptors: *Erosion control, *Sediment control, *Comparative costs, *Construction costs, *Soil erosion, *Estimated costs, Erosion rates, Cost analysis, Rainfall intensity, Water pollution, Water pollution sources, Water clarification, Soil conservation, Dredging, Desilting, California, Virginia.
Identifiers: *Universal soil loss equation, Occoquan Creek Basin(Virginia), Walnut Creek Basin(California), Rainfall erodibility index, Debris basins.

Cost information on erosion and sediment control measures was developed for over 25 methods in current widespread use in both the humid Eastern and arid Western United States. Most of the data presented were developed for the Walnut Creek Basin in California and the Occoquan Creek Basin in Virginia, but the detailed cost estimates presented provide a basis for estimating local costs elsewhere for similar control methods using three principal cost elements: labor, equipment and materials. Soil losses were estimated by using the improved universal soil loss equation. The rainfall erosion index in the soil loss equation was intensively studied, and simplified procedures for its computation were developed and presented. Cost data were applied to theoretically-predicted soil losses in both of the selected watersheds to obtain comparative costs per cubic yard of soil retained for conservation measures, and similar costs for various sediment removal methods. Control effectiveness parameters and economic life of each method were used to determine comparable annual cost figures. A central conclusion of the study was that costs of preventing erosion are, in many instances, lower than the direct costs of removing sediments from downstream areas or from water supplied. (EPA)
W74-04986

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
Prepared for the Town of Greenwich, Connecticut, May, 1973. 22 p, 14 fig.

Descriptors: *Water supply, *Connecticut, *Conservation, Environmental effects, *Watershed management, Planning, *Water demand, Ecology, Geology, Hydrology, Soils, Connecticut, Urbanization, Zoning, Natural resources.
Identifiers: Open space, *Greenwich(Conn.), Natural processes.

Part of the town of Greenwich which is of vital concern in terms of protection from urban development pressures is the water supply watershed representing most of the remaining open area within the town. The aqueduct from the Mianus River Reservoir in Stamford is the other major source of water. Intended to provide information needed to make recommendations and decisions concerning the use and development of this area, this study focuses on a corridor of wetlands and streams within the watershed and covers bedrock geology, surficial geology, ecology, hydrology, and soils. Emphasis is placed on identifying natural conditions and processes and the interrelationships among these processes or environmental subsystems. The findings of the study are grouped according to those relating to water supply, to water demands, and to the protection of resources. The town's demand for water has increased 50% in the past 10 years and the watershed, especially the central corridor, is a critical element in meeting the demand. It is proposed that in the central corridor area no residential development be allowed on poor soils, on steep slopes, or within 200 feet of streams, lakes, and wetlands. Recommendations include the use of zoning ordinances, the State Inland Wetlands Act, and the Town Plan. (Elfers-North Crolina)
W74-04996

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF

FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
For primary bibliographic entry see Field 2G.
W74-05019

EROSION CONTROL AND VEGETATIVE COVER UNDER DRYLAND CONDITIONS IN TURKEY,
Istanbul Univ. (Turkey). Faculty of Forestry.
For primary bibliographic entry see Field 3F.
W74-05220

THE HYDROMETEOROLOGICAL AND ANTIEROSION EFFECT OF FORESTS IN THE EASTERN PART OF THE CENTRAL URALS (IN RUSSIAN),
G. A. Kharitonov.
Lesovedenie. 6. p 14-24, 1970, English summary.
Identifiers: *Erosion control, Forests, Freezing, Management, Meteorological conditions, Runoff, Snow, Soils, *USSR(Central Urals), *Montane forests.

The effect of the montane forests on elements of the local climate along the watersheds and mountain slopes is discussed. The effects on the snow regime, the freezing and defreezing of soil, the surface runoff and the river runoff are described. Indexes of the anti-erosion effect of forest, and silvicultural measures for the intensification of the hydrometeorological effect of forests in the eastern part of the Central Urals, USSR, are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-05353

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
H. J. Svec, J. S. Fritz, and G. V. Calder.
Available from National Technical Information Service as PB-228 523 $4.50 in paper copy, $1.45 in microfiche. Iowa Water Resources Research Institute, Ames, Report ISWRRI - 54, January 1974. 23 p, 2 fig, 3 tab, 11 ref. OWRR A-046-IA(1).

Descriptors: *Organic compounds, Aqueous solutions, *Potable water, *Analytical techniques, Resins, *Solvent extractions, Gas chromatography, *Water analysis, Mass spectometry, Iowa, Nebraska.
Identifiers: Macroreticular resins, *Trace organic analysis.

An analytical method has been developed for concentrating, extracting, separating, and identifying natural organic compounds present in sub parts-per-million quantities in potable water. The developed technology consists of extracting trace organic compounds from water by means of macro-reticular resins, eluting them by simple and rapid solvent methods, separating the mixtures by gas chromotography, and identifying and quantifying the various pollutants by combination gas chromotography mass spectometry. The experimental XAD-2 method was compared to the standard EPA approved solvent extraction method for determining chlorinated pesticides in water and showed it to be more effective, even at parts-per-trillion levels, in recovering dieldren from river water. More than 150 compounds were identified (in about half of these cases even the specific isomer was identified) in the raw and/or treated water from fifteen Iowa and Nebraska communities. In several cases the raw water had fewer contaminants than the treated water. Presumably the additional contamination resulted from contact with treatment equipment or organic coatings (tar or asphalt) used to prevent corrosion of the iron conduits used to transport the water to consumers. (Cecil-Iowa)
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
R. Kuroda, K. Oguma, and H. Watanabe.
Journal of Chromatography, Vol 86, No 1, p 167-172, November 1973. 1 fig, 2 tab, 19 ref.

Descriptors: *Cellulose, *Separation techniques, Ions, Acids, Chromatography, Beryllium, Magnesium, Aluminum, Calcium, Titanium, Chromium, Zinc, Cadmium, Manganese, Iron, Cobalt, Nickel, Copper, Strontium, Lead, Molybdenum, Gold, Mercury, Ion exchange.
Identifiers: *Uranium, *Thin layer chromatography, Acetic acid, DEAE-cellulose, Indium, Vanadium, Gallium, Ruthenium, Scandium, Barium, Yttrium, Thallium, Thorium, Zirconium, Tin, Antimony, Tellurium, Bismuth, Rhodium, Arsenic, Germanium, Columbium, Silver, Tungsten, Iridium, Rhenium, Platinum, Selenium, Elution.

In dilute acetic acid solutions, U(VI) shows a useful chromatographic distribution on DEAE-cellulose layers, while most other metals ions migrate upwards to the solvent front or remain at or near the start. This chromatographic behavior of U(VI) enables a selective method for the separation of U(VI) by thin-layer chromatography to be developed. The R sub f values on DEAE-cellulose and Avicel SF are quoted for 34 metal ions as a function of acetic acid concentration in the range 1-6 M. Results for two- and three-component separations by elution with 1 M acetic acid are given in order to illustrate the effectiveness and utility of the present method. (Mortland-Battelle)
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
J. Franc, and K. Pospisilova.
Journal of Chromatography, Vol 86, No 1, p 159-165, November 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Chromatography, *Aromatic compounds, Acids, *Organic acids, *Pollutant identification, Organic compounds.
Identifiers: *Nitriles, *Paper chromatography, Dinitriles, Diamides, Carboxylic acid, Cyanobenzoic acid, Dicarboxylic acid, Tricarboxylic acid.

A procedure involving reaction paper chromatography for the determination of the number of nitrile groups in molecules from the shift in the R sub M values of the substance before and after reaction has been developed. A technique for the detection of substances with a nitrile group, which can be used with advantage even for other substances, has been devised. To l ml of 15-20 percent hydrogen peroxide, 1-2 drops of 15 percent aqueous NaOH solution and several milligrams of a sample of a substance containing a nitrile group were added. The mixture was shaken and filtered after 2-3 min, and the residue on the filter was dissolved in either dimethyl sulphoxide or ethanol. The solution obtained was applied directly on to the chromatographic paper as a 5 percent solution. The substances were chromatographed on Whatman No. 3 paper using n-propanol-ammonia (2:1) as the solvent. The detection was carried out by spraying with two reagents. The first reagent was prepared by mixing 5 g of hydroxylamine hydrochloride with an equivalent amount of anhydrous sodium carbonate and adding 200 ml of 96 percent ethanol. After stirring, the solution was filtered and the filtrate was used for spraying. The second reagent was a saturated aqueous solution of copper(II) acetate. The chromatogram was sprayed with the first reagent and, after drying either freely in the air or in an oven at 80C, it was sprayed with the second reagent. The coloration of the spots was observed immediately under UV light. Some substances fluoresced brightly in various colors, and some were visible even under normal light. (Mortland-Battelle)
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
M. L. Fishman, L. M. Landgraff, and D. Burdick.
Journal of Chromatography, Vol 86, No 1, p 37-51, November 1973. 5 fig, 10 ref.

Descriptors: *Amino acids, *Chemical analysis, *Data processing, Interfaces, Electronic equipment, Costs, Instrumentation, Automatic control.
Identifiers: *Data interpretation, Automatic amino acid analyzer, Programmable electronic calculator, Chemical recovery, Kjeldahl nitrogen.

The rapid calculation of data from an automatic amino acid analyzer by a programmable electronic calculator is now possible. The programmable electronic calculator offers a less expensive and more flexible alternative to large computers. Typically, data in the form of retention times and peak areas are read from a punched tape and converted into final values with a minimum of data handling. A digital integator, teletypewriter with tape punch and reader, tape editor and printer also are required. A mathematical program is described that has been devised to convert raw data from a 4-h protein hydrolyzate run into final values. The final printout presents in tabular form each amino acid as a percentage of the sample dry weight and crude protein. The total weight percentage of amino acids and percentage recovery of protein based on Kjeldahl nitrogen are also calculated. Other features of the program include the ability to eliminate up to 20 extraneous peaks from the sample and to correct for sampling errors with the aid of internal standards. Amino acid molecular weights and color constants, which are also calculated, are stored without destruction so as to permit the calculation of an unlimited number of samples from the same set of standards. (Holoman-Battelle)
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
S. W. McClean, and W. C. Purdy.
Analytica Chimica Acta, Vol 67, No 1, p 113-118, November 1973. 2 tab, 8 ref.

Descriptors: *Iron, *Electrochemistry, *Pollutant identification, Methodology, Chemical analysis, *Volumetric analysis, Heavy metals, Electrodes.
Identifiers: *Coulometric titration, Cerium, *Ferroin, Precision, Accuracy, Metal complexes, 1 10-Phenanthroline, Chemical concentration, End-point detection system.

Iron bound to 1,10-phenanthroline (ferroin) was determined by coulometric titration with electrogenerated cerium(IV). Titrations were performed in which generation was stopped from 1 min after about 80 percent of the sample had been titrated. No significant differences were observed between these titrations and those run with no delay. Those iron samples in the range 0.1-130 micrograms were titrated with a relative standard deviation of 0.7-5.0 percent and a relative error of

0-4.0 percent with the greatest inaccuracies and imprecision being at the lower end of the range, where titration times were shortest. The end-point detection system consisted of a platinum and a saturated calomel electrode across which a constant voltage is impressed. This voltage is such that the platinum electrode is 1.025 V vs N.H.E. The current between the indicating electrodes is monitored with a current-sensing device possessing a sensitivity of 0.0001 microA/mm. (Holoman-Battelle)
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
P. Schramel.
Analytica Chimica Acta, Vol 67, No 1, p 69-77, November 1973. 10 fig, 3 tab, 6 ref.

Descriptors: *Trace elements, Calcium, Potassium, Sodium, Phosphorus, Aluminum, Cadmium, Copper, Chromium, Iron, Manganese, Lead, Sulfur, *Metals, Pollutant identification, *Spectrophotometry.
Identifiers: Flameless atomic absorption spectrophotometry, *Biological samples, Wet ashing, Human tissue, Vanadium, Tissue, Muscle, Plancenta, Sample preparation, Chemical interference.

Flameless atomic-absorption spectrometry was used to measure the concentration of trace elements (Al, Cd, Cr, Cu, Fe, Mn, Pb, and V) in biological material prepared by a wet-ashing procedure. The final wet-ashing procedure, applied in the present work, was as follows: cover 100-150 mg of dry sample with 100 microliters of concentrated sulphuric acid, and heat until fumes of sulphur trioxide appear. Then add dropwise 1.5-2 ml of 50 percent hydrogen peroxide until a clear solution is reached. Cool and dilute to 10 ml with twice-distilled water. Solutions prepared in this way were suitable for all the elements studied. All calibration curves were obtained with 10-microliter amounts of each 'pure' standard solution prepared in 0.18 M sulphuric acid. Subsequently, the effects of the matrix elements, calcium, potassium, sodium, and phosphorus were investigated. The interference of sulphur was taken into consideration by applying a 0.18 M sulphuric acid standard solution. The results showed that there were no interferences for the elements Al, Cd, Cu, Cr, Fe, and Mn; for all these metal ions, the calibration curves found were the same as with 'pure' standard solutions. There are very strong interferences with the absorbance signal in the case of lead. The 'pure' standard solutions of this element gave absorbance signals which were about three times higher than the signals in the case of the IBS matrix. Interferences were less significant in the case of vanadium. The results verified the usefulness and speed of the wet-ashing procedure for destroying biological materials and of the flameless atomic absorption procedure for analyzing particular trace elements in these materials. (Mortland-Battelle)
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
G. Raspi, P. Zanello, A. Cinquantini, and P. Corti.
Analytica Chimica Acta, Vol 66, No 3, p 435-442, October 1973. 2 fig, 3 tab, 19 ref.

Descriptors: *Copper, *Electrochemistry, *Chemical analysis, Aqueous solutions, Heavy metals, Methodology, Hydrogen ion concentration, Cations, Anions, Pollutant identification.
Identifiers: *Voltammetry, *Metal complexes, *Ligands, Reproducibility, Periodates, Tellurates, Amperometric titration, Ionic interference, Detection limits.

The voltammetric behavior of diperiodatocuprate(III) and ditelluratocuprate(III) complexes was investigated in aqueous solution at a platinum microelectrode for which the diffusion layer was periodically renewed. The voltammetric determination of Cu(II) was also investigated. The copper(II) and copper(III) complexes with periodate or tellurate ligands are electroactive at a smooth platinum electrode, giving an anodic, cathodic or cathanodic wave in the presence of alkaline hydroxide solutions containing copper(II), copper(III), or copper(II)-copper(III) species, respectively. The following analytical applications are proposed: (a) amperometric titration of copper(III) solutions; (b) voltammetric determination of copper. Results of amperometric titrations of copper(III) were similar to those by an established procedure. Voltammetry of copper(II) allows the metal to be determined down to concentrations of 0.00001 M, even in the presence of different ions; the procedure can be applied to such heat-transfer media for nuclear reactors as sodium and potassium metals and their hydroxides. (Holoman-Battelle)
W74-04870

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
B. E. Baker.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 279-284, November 1973. 4 fig, 4 ref.

Descriptors: *Chemical reactions, *Pollutant identification, *Methodology, Organic compounds, Separation techniques, Chlorinated hydrocarbon pesticides, Fungicides.
Identifiers: *Hexachlorobenzene, Chlorinated hydrocarbons, Lindane, Monoethoxypentachlorobenzene.

When hexachlorobenzene (HCB) is treated with sodium ethoxide, monoethoxypentachlorobenzene is formed. This chemical reaction can be used to identify and confirm the presence of HCB. That this same derivative can be used to identify HCB in the presence of isomers of lindane has been confirmed. A hexane solution of 1 microgram each of HCB and lindane was treated with sodium ethoxide and mixed with water. Sufficient HCl was added to give an acid reaction, the mixture extracted with hexane, dried over sodium sulfate, and analyzed by GC. After heating under reflux for 1 hr, product analysis showed the presence of unreacted HCB, MEPCB, and an unidentified peak X. (Holoman-Battelle)
W74-04871

OXYCHLORDANE RESIDUES IN HUMAN ADIPOSE TISSUE,
Environmental Protection Agency, Perrine, Fla. Primate and Pesticides Effects Lab.
F. J. Biros, and H. F. Enos.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 257-260, November 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Mass spectrometry, DDE, DDT, Separation techniques, Monitoring, *Pollutant identification.
Identifiers: *Adipose tissue, *Oxychlordane, Beta-HCH, Biological samples, Heptachlor epoxide, Sample preparation, Thin layer chromatography, Chlordane.

Twenty-seven specimens of adipose tissue collected from post-mortem examinations and therapeutic surgery were analyzed for a series of organochlorine residues by gas and thin-layer chromatography. Results were confirmed using mass and infrared spectral analyses. Two column were employed for gas chromatography: 1.5 percent OV-17/1.95 percent QF-1, RRT subaldrin of oxychlordane, 1.38 at 200 C and 5 percent OV-210 RRT subaldrin of oxychlordane, 1.56 at 180 C. The tissue was extracted with petroleum ether. Results showed the presence of beta-HCH, oxychlordane, p,p'-DDE, o,p'-DDT, p,p'-DDT, and heptachlor epoxide. The occurrence of storage of oxychlordane residues in general population human adipose tissue may indicate consistent previous exposure to chlordane insecticide and/or oxychlordane from many possible sources. (Little-Battelle)
W74-04872

REDESCRIPTION OF MAPPATES PLATAXUS RANGNEKAR (COPEPODA: CALIGIDAE),
Kerala Univ., Trivandrum (India). Dept. of Aquatic Biology and Fisheries.
For primary bibliographic entry see Field 2I.
W74-04877

THE CHARACEAE OF SOUTHEASTERN UNITED STATES,
Rhode Island Univ., Kingston. Dept. of Botany.
M. C. Choudhary, and R. D. Wood.
The American Midland Naturalist, Vol 90, No 2, p 413-446, October 1973. 1 tab, 93 ref.

Descriptors: *Chara, *Chlorophyta, *Southeast U.S., *Speciation, Varieties, *Systematics, Aquatic algae, Marine algae.
Identifiers: *Nitella, Chara vulgaris, Chara canescens, Chara globularis, Chara zeylanica, Chara braunii, Chara fibrosa, Chara hornemannii, Nitella flexilis, Nitella acuminata, Nitella clavata, Nitella cernaua, Nitella capillata, Nitella furcata, Nitella tenuissima, Nitella gracilis, Nitella hyalina, Nitella translucens, Chara globularis var. virgata, Chara globularis var. leptosperma, Nitella clavata var. dilatata, Nitella gracilis var. leptosoma, Nitella gracilis var. asagrayana, Nitella gracilis var. capitellata.

A study was made of characeae of the 10 southeastern states based upon preserved and herbarium specimens. The findings are compiled in a floristic report containing a key to species, notes on each species and variety - a brief synonymy, list of published records, sources of illustrations and exsiccatae and remarks on the taxa. The Characeae of the Southeast comprise two genera, Chara and Nitella, and 17 species which represent a large proportion of the three genera and 22 species treated for North America. The frequency of occurrence of Characeae was 5 percent, far lower than the 19 percent in Fiji and 28 percent in Australia. A new taxon, N. flexilis var. americana, from Florida, resembles N. flexilis but has distinct mueus. Taxa newly reported for the region are C. globularis var. virgata, var. leptosperma, N. clavata var. dilatata, and N. gracilis var. leptosoma and var. asagrayana. Particular attention is paid to the infraspecific variation of C. zeylanica, and a number of varieties and forms previously recorded from other areas were found to be represented in the Southeast. Mohr's (1884) unusual collections from Mobile were re-examined, and for the most part the original identifications were confirmed. (Holoman-Battelle)
W74-04879

TAXONOMY, DISTRIBUTION AND ECOLOGY OF THE GENUS SESARMA (CRUSTACEA, DECAPODA, GRAPSIDAE) IN EASTERN NORTH AMERICA, WITH SPECIAL REFERENCE TO FLORIDA,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
For primary bibliographic entry see Field 2I.
W74-04880

SCANNING ELECTRON MICROSCOPY OF BACTERIAL COLONIES,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
E. G. Afrikian, G. St. Julian, and L. A. Bulla, Jr.

Applied Microbiology, Vol 26, No 6, p 934-937, December 1973. 3 fig, 14 ref.

Descriptors: *Pollutant identification, *Cytological studies, Methodology, Electron microscopy, Cultures, Bacteria.
Identifiers: *Scanning electron microscopy, *Bacterial colonies, Reproducibility, Sample preparation, Culturing techniques, Bacillus cereus, Bacillus subtilis, Bacillus cereus var. mycoides, Culture media.

A technique is described for observing bacterial colony growth. Bacillus cereus, B. subtilis, and B. cereus var. mycoides were grown on strips of dialysis membrane layered on nutrient agar. Microcolonies of the organisms on strips were fixed in Formalin vapor in situ; the strips then were removed from the agar and secured to scanning microscope specimen stubs without markedly disturbing the cellular arrangement. Scanning electron micrographs clearly depict morphology of individual cells, as well as the spatial orientation of cells within the colony. This technique is reproducible, adaptable, and simple. (Holoman-Battelle)
W74-04885

RECOVERY AND IDENTIFICATION OF ANAEROBES: A SYSTEM SUITABLE FOR THE ROUTINE CLINICAL LABORATORY,
Columbia-Presbyterian Medical Center, New York. Diagnostic Microbiology Service.
P. D. Ellner, P. A. Granato, and C. B. May.
Applied Microbiology, Vol 26, No 6, p 904-913, December 1973. 4 fig, 8 tab, 16 ref.

Descriptors: *Anaerobic bacteria, *Pathogenic bacteria, *Pollutant identification, *Isolation, Methodology, Laboratory tests, Antibiotics(Pesticides).
Identifiers: Culture media, *Culturing techniques, *Recovery, Selective media, Gas liquid chromatography, Gram-negative bacteria, Gram-positive bacteria, Clostridium cadaveris, Clostridium histolyticum, Clostridium lentoputrescens, Clostridium subterminale, Clostridium tetani, Clostridium cochlearium, Body fluids, Blood, Biochemical tests, Bacteroides serpens, Bacteroides spp, Drug resistance, Fusobacterium nucleatum, Fusobacterium spp, Eubacterium spp, Arachnia propionica, Peptococcus magnus.

A system is described in which clinical specimens to be cultured for anaerobes are plated on reducible media and incubated in Gas Pak jars for 24 h. Clinical specimens were carfully selected for culture using this system. Generally those specimens originating from body sites harboring normal commensal flora were not cultured. Several experimental formulations of the prereduced anaerobically sterilized (PRAS) transport media were compared with Amies transport medium without charcoal. Using Clostridium novyi B, no significant advantage was observed with the experimental media over Amies medium. Selective and nonselective formulations of reducible media were used for primary isolation. The isolates were identified according to the Gram stain of the pure chopped meat glucose (CMG) culture in combination with gas-liquid chromatography. Pure, undiluted 24-h CMG culture was used to inoculate anaerobic blood agar (anBAP) for antibiotic susceptibility testing. Antibiotic disks of penicillin, ampicillin, carbenicillin, chloramphenicol, tetracycline, erythromycin and clindamycin were used. The methods have been tested in a high-volume routine microbiology laboratory (more than 700 specimens per day), but are also suitable for smaller laboratories. The system permits improved recovery and identification of the majority of anaerobes within a time period commensurate with clinical practice. Preliminary reports with presumptive identification are often available within 48 h, and the final report with complete identification and antibiogram is usually available within 4 days. (Holoman-Battelle)
W74-04886

METHOD FOR RADIORESPIROMETRIC DETECTION OF BACTERIA IN PURE CULTURE AND IN BLOOD,
Biospherics, Inc., Rockville, Md.
J. R. Schrot, W. C. Hess, and G. V. Levin.
Applied Microbiology, Vol 26, No 6, p 867-873, December 1973. 6 fig, 2 tab, 21 ref.

Descriptors: Methodology, *Bacteria, *Pollutant identification, *Radioactivity techniques, Testing procedures, Laboratory tests, Laboratory equipment, Carbon radioisotopes, Instrumentation, Time, E. coli, *Cultures, Streptococcus, Detergents.
Identifiers: Pure cultures, *Blood, *Radiorespirometry, Trace levels, Carbon dioxide evolution, Culture media, Body fluids, Biological samples, Pseudomonas aeruginosa, Klebsiolla, Staphylococcus aureus, Salmonella paratyphi B, Salmonella typhi, Salmonella dysenterae, Haemophilus aphrophilua,Enterobacter aerogenes, Serratia marcescens, Proteus vulgaris, Cardiobacterium, Rhozyme, Triton X-100.

Methods are described for the detection of low numbers of bacteria by monitoring C-1402 evolved from C-14-labeled substrates. Cell suspensions are filtered with membrane filters, and the filter is then moistened with 0.1 ml of labeled medium in a small, closed apparatus. Evolved C-1402 is collected with Ba(OH)2-moistened filter pads and assayed with conventional radioactivity counting equipment. The kinetics of C-1402 evolution are shown for several species of bacteria. Fewer than 100 colony-forming units of most species tested were detected in 2 h or less. Bacteria were inoculated into blood and the mixture was treated to lyse the blood cells. The suspension was filtered and the filter was placed in a small volume of labeled medium. The evolved C-1402 was trapped and counted. A key development in the methodology was finding that an aqueous solution of Rhozyme and Triton X-100 produced lysis of blood but was not detrimental to bacteria. (Holoman-Battelle)
W74-04887

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
A. Vuye, and J. Pijck.
Applied Microbiology, Vol 26, No 6, p 850-854, December 1973. 1 fig, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Enteric bacteria, Coliforms, Shigella, Salmonella, Aerobic bacteria, Pathogenic bacteria.
Identifiers: *Culture media, *Urease, *Biosynthesis, *Selective media, Biochemical characteristics, Enzyme activity, Solid media, Liquid media, Biological samples, Proteus spp, Yersinia, Escherichia, Edwardsiella, Arizona, Citrobacter, Klebsiella pneumoniae, Klebsiella ozoenae, Klebsiella rhinoscleromatis, Enterobacter cloacae, Enterobacter aerogenes, Enterobacter hafniae, Enterobacter liquefaciens, Pectobacterium, Serratia, Providencia, Elek medium, Christensen urea agar, Fecal coliforms, Stuart media, Proteus mirabilis.

Detection and intensity of urease activity in enterobacteriaceae greatly varies as a function of the media or techniques used, or both. A comparative investigation on several solid and liquid media led to the following conclusions. (1) Detection of Proteus spp. can be adequately performed with the highly selective solid medium described by Cook (1948), as well as with the different liquid media described (Stuart standard and rapid media; Elek medium). (2) Detection of Klebsiella should be based upon urease production on solid media with low buffer capacity (Christensen, 1964). (3) For the identification of Yersinia, either the solid Christensen urea agar or the rapid Elek technique gives optimal results. (Holoman-Battelle)
W74-04888

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
S. K. A. Danso, M. Habte, and M. Alexander.
Canadian Journal of Microbiology, Vol 19, No 11, p 1450-1451, November 1973. 2 fig, 1 ref.

Descriptors: *Bacteria, *Soils, *Cultures, Ecosystems, Growth rates, Inhibitors, Antibiotics(Pesticides), Pollutant identification, Methodology, Cultures, Measurement.
Identifiers: Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, Rhizobium meliloti, Mutants, Streptomycin, Neomycin, Polymyxin, Penicillin, Tetracycline, Chloramphenicol, Crystal violet, Congo red, Culture media.

The abundance of individual strains of Xanthomonas, Erwinia, and Rhizobium added to soil was determined by a method that allows for the enumeration of surviving cells on the introduced population in the presence of many other soil microorganisms. The method should be useful for measuring numbers of other bacteria in heterogeneous communities. The method involves using mutants of the species of interest which are resistant to antibacterial agents that prevent the growth of nearly all other populations in the environment. The bacteria used were Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, and Rhizobium meliloti. Streptomycin was selected as the chemical of choice since Rhizobium mutants could be obtained easily by growing the cultures in yeast extract - mannitol broth containing about 50 micrograms streptomycin sulfate/ml and transferring the survivors to the same medium containing higher antibiotic concentrations. By these means, isolates resistant to 1000 micrograms streptomycin sulfate/ml were obtained. Spontaneous mutants of X. campestris and E. carotovora were obtained by inoculating large numbers of the cells into trypticase soy broth containing 800 micrograms streptomycin sulfate/ml, incubating the broth until growth was observed, plating the suspension on a solid medium of the same composition. It should not be too difficult to obtain mutants of other species which grow in media containing antibacterial compounds in concentrations sufficiently high to prevent the replication of large percentages of the residents of natural ecosystems. (Mortland-Battelle)
W74-04890

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
N. Garber, and B. Lupowitz-Donenfeld.
Canadian Journal of Microbiology, Vol 19, No 11, p 1401-1405, November 1973. 7 fig, 21 ref.

Descriptors: E. coli, *Growth rates, *Bacteria, Pseudomonas, Salmonella, Streptococcus, Bioindicators, Cultures, Iron, Calcium, Chelation, Turbidity, Inhibitors, Separation techniques, Isolation.
Identifiers: *Thyroxine, *Triiodothyronine, EDTA, Hormones, Bacillus cereus, Bacillus licheniformis, Streptococcus faecalis, Staphylococcus albus, Serratia marcescens, Shigella boydii, Pseudomonas aeruginosa, Salmonella typhi, Aerobacter aerogenes, Potassium iodide, Differential media, Gram-negative bacteria, Gram-positive bacteria, Bacterial physiology.

The effects of L-thyroxine, D-thyroxine, and 3,5,3'-triiodothyronine on the growth of several Gram-positive and Gram-negative bacteria were examined. The first two compounds, at a concentration of 0.000077 M, were found to have a considerable inhibitory effect while 3,5,3'-triiodothyronine had a very weak effect on the growth of the Gram-positive bacteria examined.

The growth of the Gram-negative bacteria was not inhibited under the same conditions. Potassium iodide, at the same concentration, was not inhibitory. Release of free iodine from the thyroxine preparation was also excluded as contributing to the thyroxine effect because it was shown to be less toxic than thyroxine for Bacillus cereus 569 and to exhibit a similar inhibitory effect on Gram-positive and Gram-negative bacteria. The inhibition of Gram-positive bacteria by L-thyroxine was reduced by cations such as Mn(2 plus), Fe(2 plus), and Ca(2 plus). However, the hormones were more potent in their effect compared to EDTA in the same molar concentration and the inhibition exerted by them was not so easily abolished by the divalent cations as it was in the case of EDTA. Although chelation could contribute to the inhibition of the bacteria by the iodinated hormones, it seems that it is not the only factor involved. (Mortland-Battelle)
W74-04891

METHOD FOR ROUTINE CULTURING OF STRICT ANAEROBIC BACTERIA,
Pretoria Univ. (South Africa). Dept. of Microbiology.
L. van Wyk.
Laboratory Practice, Vol 22, No 11, p 681, November 1973. 6 ref.

Descriptors: *Anaerobic bacteria, *Cultures, Incubation.
Identifiers: Agars, Reazurin, Inoculation, Slant cultures, Sample preservation, Culture media, Sample preparation, Culturing techniques.

Routine culturing of marine anaerobes is accomplished by adding 4 ml anaerobic medium to McCartney bottles previously gassed with a CO2, N2, and H2 mixture. The tightly stoppered bottles are sterilized at 121C for 15 minutes and cooled in a slanted position. The bottles are then filled with a sterile semisolid agar containing 0.15 g washed agar, 0.0001 g reazurin, 2.5 ml reducing solution, and 100 ml distilled water. This agar together with rubber-lined metal caps, protects the slant culture from air, and the indicator shows if the medium becomes too oxidized to permit growth of the anaerobes. Inoculation of the slants can be carried out with a platinum loop in a stream of sterile CO2 without air ever coming into direct contact with the grown medium. By this method cultures of anaerobic bacteria from sheep rumen were effortlessly maintained. After initial incubation at 38C for 48 hr, cultures were stored at 4C for 60 d, whereupon transfers were successfully made to fresh anaerobic slants. Slides for gram stains were easily prepared from these slant cultures. Since the preparation of media is time consuming, a large number of McCartney bottles may be simultaneously prepared as described and stored at 4C until required without marked changes in the medium taking place. (Mortland-Battelle)
W74-04894

LIPOPOLYSACCHARIDE FROM A GRAM-NEGATIVE MARINE BACTERIUM,
Providence Coll., R.I. Dept. of Biology.
A. Mongillo, K. Deloge, D. Pereira, and G. P. O'Leary.
Journal of Bacteriology, Vol 117, No 1, p 327-328, January 1974. 1 tab, 18 ref.

Descriptors: *Marine bacteria, *Lipids, Sands, Sea water, Cultures, Nutrients, Sodium chloride, Centrifugation, Chromatography, *Rhode Island.
Identifiers: *Lipopolysaccharides, Lipid A, Pseudomonads, *Narragansett Bay(R.I.), Paper chromatography.

To investigate the occurrence of marine lipopolysaccharides, a number of marine microorganisms were isolated from sand and seawater collected from Narragansett Bay, Rhode Island. Upon initial screening, one organism was chosen for analysis. Cultural and biochemical characteristics indicated that the organism was a nonmotile pseudomonad. The organism was routinely cultivated at room temperature with constant shaking in a medium containing 5.0 g of nutrient broth, 8.0 g of yeast extract, and the complete salts solution per liter of distilled water. The organism was grown for 24 hr, harvested by centrifugation, washed in complete salt solution, and extracted by the phenol-salts method. The material isolated from this marine pseudomonad as lipid A showed many of the characteristics of other lipid A molecules: it contained glucosamine, and phosphate; its solubility in lipid solvents such as chloroform indicated the presence of fatty acids; and the two hexoses present, glucose and galactose, are also commonly found in the polysaccharide portion of the LPS molecule. Absent from the preparation was the heptose monosaccharide. The absence of the core could indicate that this pseudomonad may only produce an incomplete LPS. Another possibility is that the proper concentration of cations were not present during the extraction to hold the core portion intact. The organism does, however, possess a type of lipopolysaccharide molecule. (Mortland-Battelle)
W74-04896

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
D. A. Williams.
Biometrics, Vol 29, No 4, p 695-700, December 1973. 2 tab, 3 ref.

Descriptors: *Estimating, *Statistical methods, Equations, *Bioassay, Lethal limit, Mathematical studies.
Identifiers: Symmetric bioassay, *Relative potency, Mean square error, Parabolas.

Three estimators of relative potency from two parabolas in symmetric bioassays, the estimator proposed by Elston (1965), the maximum likelihood (ML) estimator, and the usual estimator assuming linearity, are compared. The results of a simulation study indicate that in well designed assays Elston's estimator performs at least as well as the other two estimators, whether or not the log-dose response regression is linear. (Holoman-Battelle)
W74-04899

AN APPRAISAL OF IDENTIFICATION METHODS FOR PENICILLIUM SPECIES: NOVEL TAXONOMIC CRITERIA BASED ON TEMPERATURE AND WATER RELATIONS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Food Research.
J. I. Pitt.
Mycologia, Vol 65, No 5, p 1135-1157, September/October 1973. 1 fig, 6 tab, 22 ref.

Descriptors: *Cultures, *Speciation, *Fungi, Systematics, Temperature, Pollutant identification, Methodology.
Identifiers: *Culture media, *Water activity, *Penicillium, Eupenicillium, Paecilomyces, Talaromyces.

Examination of media and methods currently used in Penicillium taxonomy led to the conclusion that by using only two media, Czapek yeast autolysate agar and malt extract agar, and by incubating cultures at 25C for 7 days, one could obtain classical taxonomic data with optimal efficiency. The effect of reduced water activity and reduced and elevated temperatures on the growth of Penicillium spp. accepted in the Raper and Thom A Manual of the Penicillia was studied. On a glycerol-nitrate salts agar of 0.93 water activity, and on Czapek yeast autolysate agar at 5C and 37C, extent of growth after 7 days provided taxonomically valuable data; within-species variation was low, while between-species variation was sufficiently marked to assist in determinative classification. Moreover, water relations, as assessed by the above technique, showed a very high correlation with penicillus type in some Sections of the genus. (Little-Battelle)
W74-04902

IMPROVED PH CONTROL OF FUNGAL CULTURE MEDIA,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
J. J. Child, C. Knapp, and D. E. Eveleigh.
Mycologia, Vol 65, No 5, p 1078-1086, September/October 1973. 1 fig, 4 tab, 14 ref.

Descriptors: *Fungi, *Hydrogen ion concentration, *Growth rates, Phosphates.
Identifiers: *Culture media, Aspergillus midulans, Penicillium patulum, Claviceps, Sporulation, Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Coprinus comatus, Geotrichum candidum, Neurospora crassa, Penicillium chrysogenum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, Zygorhynchus.

A number of fungi grew well in the presence of relatively high concentrations (40 millimoles) of phosphate and MES (2-(N-morpholino) ethane sulfonic acid) buffers at either pH 5.5 or 7.0. In certain instances better growth and sporulation were observed than that found using more conventional growth media (malt, Czapek-Dox) that lack any marked buffering capacity. EMTA (3,6-endomethylene-1,2,3,6-tetrahydro-cisphthalic acid) could be used as a buffer for fungal culture media with certain species only. As good growth and no major change in chemical composition occurred, these buffers are recommended for use in high concentration to eliminate pH variation in comparative physiological studies. Fungal strains used were: Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Claviceps sp., Coprinus comatus, Geotrichum candidum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, and Zygorhynchus sp. (Little-Battelle)
W74-04903

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
W. A. Bough.
Journal of Milk and Food Technology, Vol 36, No 11, p 547-553, November 1973. 1 fig, 7 tab, 14 ref.

Descriptors: *Effluents, *Canneries, *Waste identification, Acidity, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Dissolved solids, Hydrogen ion concentration, Waste disposal, *Pollutant identification.
Identifiers: *Vegetables, Characterization, Settleable solids, Effluent standards.

Analysis of data on composite waste loads from canning of collard, turnip, mustard, spinach, and kale greens revealed no significant differences among the five types of greens. For unit effluents from the dunker washers, reel washers, and blancher, significant differences were found for solids load and total acidity. The most concentrated effluent was from the tumbler fillers. The average composite waste load for all leafy greens was 20.2 plus or minus 5.7 lb/ton COD, 8.5 plus or minus 2.8 lb/ton BOD, 2.8 plus or minus 1.2 lb/ton suspended solids, and 2,666 plus or minus 427 gal/ton waste water. These values are less than one-half of those previously reported for wastes from spinach greens. These results suggest possibly improvement for inplant control of waste from leafy greens, and may also be relevant to the setting of effluent standards for the fruit and vegetable industry. (Mortland-Battelle)
W74-04904

MULTIPURPOSE MEDIUM FOR USE WITH PSEUDOMONAS SPECIES,
Boston City Hospital, Mass. Channing Lab.
S. L. Rosenthal.
Applied Microbiology, Vol 26, No 6, p 1013-1014, December 1973. 1 tab, 3 ref.

Descriptors: *Pseudomonas, *Pollutant identification, *Testing procedures, Denitrification, Hydrolysis, Cultures, Aerobic bacteria, Methodology.
Identifiers: *Culture media, *Biochemical characteristics, Chemical composition, Substrate utilization, Gelatinase, Starch, Acinetobacter, Pseudomonas aeruginosa, Pseudomonas maltophilia, Pseudomonas cepacia, Pseudomonas putida, Pseudomonas pseudoalcaligenes, Pseudomonas alcaligenes, Pseudomonas marginata, Pseudomonas stutzeri, Pseudomonas acidovorans, Pseudomonas diminuta, Pseudomonas fluorescens, Pseudomonas mendocina, Pseudomonas testosteroni.

A medium consisting of the following can be used to detect starch hydrolysis, gelatinase production, and denitrification by pseudomonads: yeast extract (Difco) 5 g; KNO3, 5 g; K2HPO4, 1 g; gelatin, 4 g; soluble starch, 2 g; agar (Difco), 15 g; water, 1,000 ml. Fifty-eight Pseudomonas strains were grown on the medium. The identity of P. aeruginosa was confirmed by the presence of the characteristic odor and pigments and by the possession of acetamide deaminase. The requirement for methionine as a growth factor served as a confirmatory test for P. maltophilia. The remaining species were identified by a battery of 14 single carbon source assimilation tests. All strains grew rapidly and well on the medium. Forty-nine Acinetobacter strains were also tried. All grew well aerobically and had either positive or negative tests for gelatinase. None grew anaerobically. (Holoman-Battelle)
W74-04906

ISOLATION AND CHARACTERIZATION OF A THERMOTOLERANT METHANOL-UTILIZING YEAST,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
D. W. Levine, and C. L. Cooney.
Applied Microbiology, Vol 26, No 6, p 982-990, December 1973. 5 fig, 3 tab, 17 ref.

Descriptors: *Isolation, *Pollutant identification, *Cytological studies, *Biological properties, Yeasts, Soil fungi, Growth rates, Toxicity, Heat resistance, Organic compounds, Soil microorganisms, Temperature, Proteins, Amino acids, Methodology, Chemical analysis.
Identifiers: *Methanol, Characterization, *Hansenula polymorpha, Ascomycetes, Substrate utilization, Growth media, Chemical composition, Continuous cultures, Culture media, Nucleic acids, Rats.

A yeast capable of growth on methanol as its sole carbon-energy source was isolated from soil samples and identified as a strain of Hansenula polymorpha. A continuous enrichment culture at 37C with a simple mineral salts medium was used to select this organism. The isolate, designated DL-1, has a maximal specific growth rate of 0.22 per h, at pH 4.5 to 5.5 and temperatures of 37 to 42C, in simple mineral salts medium with methanol (0.5 percent), biotin, and thiamine. Growth occurred in a chemostat at temperatures up to 50C, with strong growth at 45C. The maximal growth yield of the yeast on methanol was 0.36 g of dry cell weight per g of methanol, and the yield on oxygen was 0.37 g of dry cell weight per g of O2. Protein content of the isolate is 46 percent, and total nucleic acid content varies from 5.0 to 7.0 percent with increasing growth rate from 0.08 to 0.20 per h. The amino acid profile of this yeast protein indicated that it could serve as a good source of food protein. Feeding studies with rats show the yeast to have no toxic effects. (Holoman-Battelle)
W74-04907

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England). National Collection of Type Cultures.
S. P. Lapage, S. Bascomb, W. R. Willcox, and M. A. Curtis.
Journal of General Microbiology, Vol 77, No 2, p 273-290, August 1973. 1 fig, 7 tab, 26 ref.

Descriptors: *Aerobic bacteria, *Numerical analysis, *Computer programs, *Enteric bacteria, Probability, Statistical methods, Laboratory tests, E. coli, Pathogenic bacteria, Coliforms, Shigella, Pseudomonas, Pollutant identification.
Identifiers: Salmonella typhi, Moraxella, Citrobacter, Chromobacterium violaceum, Pasteurella, Gram-negative bacteria.

A probability method for identification of bacteria is discussed. Gram-negative, rod-shaped bacteria were chosen as a model and a table (matrix) was constructed which contained the estimated probabilities of a positive result in each test for each taxon. The results of tests on an unknown strain were compared with the stored probabilities and the likelihood that the strain belonged to each of the matrix taxa was calculated in turn by multiplication of the relevant probabilities. These likelihoods were normalized and the value for each taxon referred to as the identification score for that taxon. This procedure was applied to reference strains and to freshly isolated strains (field strains) from various medical diagnostic bacteriological laboratories. The resulting data were used to improve the matrix, investigate the number of tests needed for identification, estimate test differences between laboratories and for test selection strategies. The matrix was stored in a computer in which all calculations were carried out. Identification rates for fermentative bacteria of 90.8 percent for reference strains and 89.4 percent for field strains were obtained, and for nonfermentative bacteria of 82.1 percent and 70.8 percent respectively. The field strains were received because they were difficult to identify in the medical diagnostic laboratory; higher rates of identification might be expected for typical strains. (See also W74-04910) (Mortland-Battelle)
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England). National Collection of Type Cultures.
S. Bascomb, S. P. Lapage, M. A. Curtis, and W. R. Willcox.
Journal of General Microbiology, Vol 77, No 2, p 291-315, August 1973. 5 tab, 178 ref.

Descriptors: *Pollutant identification, *Numerical analysis, *Computer programs, *Enteric bacteria, E. coli, Salmonella, Shigella, Analytical techniques, Laboratory tests, Aerobic bacteria, Pathogenic bacteria, Proteins.
Identifiers: Klebsiella, Gram-negative bacteria.

The results of the identification of 1079 reference strains of Gram-negative, aerobic, rod-shaped bacteria by the probabilistic method in a computer are given. Comparison of identification by conventional methods and by computer showed that 90.8 percent of fermentative and 82.1 percent of nonfermentative strains could be identified on the best available probability matrix. Many of these strains were typical and had caused difficulty in identification in the medical diagnostic laboratory. The implications of various factors in successful computer identification are discussed and the results are given for each taxon by genus and species. (See also W74-04909) (Mortland-Battelle)
W74-04910

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
P. G. Mikolaj.
Available from NTIS, Springfield, Va. 22151 Com73-11613; Price $2.75 printed copy; $1.45 microfiche. Report, August 1973. 9 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *California, *Gas chromatography, *Trace elements, Provenance, *Pollutant identification, Chemical analysis, Oil fields.
Identifiers: *Santa Barbara Channel(Calif).

Oil from the area of new hydrocarbon upwelling in the Santa Barbara Channel was analyzed by gas chromatography and characterized by trace elements. The chemical composition of oil from the new area of hydrocarbon upwelling is significantly different from oil originating at the nearshore natural seeps in the vicinity of Coal Oil Point. Compared to oil from the Coal Oil Point region, the new seep oil contains approximately one-half the concentration of nickel and vanadium. Oil from Coal Oil Point is highly naphthenic, while oil from the new seep contains significant amounts of normal paraffins out to carbon number 30 and beyond. Oil from the new seepage area is generally similar to oils produced from the Sisquoc and Monterey formations of the Santa Barbara Channel. The site of the new hydrocarbon upwelling is located in the middle of an area where, during the period 1946 to 1947, previous oil and gas seeps of natural origin were reported. (Knapp-USGS)
W74-04919

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
P. E. Davis.
Available from the National Technical Information Service as PB-228 872, $6.00 in paper copy, $1.45 in microfiche. Research Report No. 36, 1973. 51 p, 7 fig, 4 tab, 5 ref, append. OWRR A-022-TENN(1).

Descriptors: *Water quality, *Monitoring, *Tennessee, *Reservoirs, *Forecasting, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Hydrologic data, Streamflow.
Identifiers: *Fort Loudoun Reservoir(Tenn).

An investigation was made of the reliability of continuous water quality monitoring on Fort Loudoun Reservoir. Two continuous monitoring systems were used, and the parameters of temperature, dissolved oxygen, pH, and conductivity were considered. Manual cross sectioning was used to determine the various values in the stream. At both stations, the data taken from the monitor was found to provide an accurate prediction of the conditions of the stream. A comparison of samples taken at the pumps and at the monitors showed that no appreciable change in any of the parameters was induced by the intake systems.
W74-04982

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W74-05045

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5C.
W74-05055

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. HASL-276. $7.60 per copy, $1.45 microfiche. Report HASL-276, Oct. 1973. 176 p, 8 fig, 38 tab, 90 ref, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Forest soils, Vegetation, Ranges, Diets, Toxicity, Data collections.
Identifiers: *Iridium, *Plutonium, New York City, San Francisco.

Current data are presented from the HASL Fallout Program; The National Center for Atmospheric Research in Boulder, Colorado; The National Radiation Laboratory in New Zealand; and the EURATOM Joint Nuclear Research Centre at Ispra, Italy. Interpretive reports and notes are included on the global deposition of Sr-90 through 1972, sulfate concentrations in the lower stratosphere, global fallout in a forest compared with an open field, and detection of Ir-192 from recent nuclear tests in the southern hemisphere. Extensive tabulations of radionuclide levels in fallout, surface air, stratospheric air, milk, diet, and tap water are included. A bibliography of recent publications related to radionuclide studies is also presented. (See also W74-05175) (Houser-ORNL)
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. No. HASL-276, Append. $10.60 per copy, $1.45 microfiche. Report No. HASL-276-Appendix, Oct. 1, 1973. 459 p, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Soils, Ranges, Diets, Toxicity, Data collections, Data processing, Data storage and retrieval, Data transmissions.
Identifiers: *Iridium, *Plutonium.

There are 35 monthly monitoring sites in the United States and 90 in other countries. A map showing the sites is presented. To facilitate the accurate storage, retrieval and handling of the data generated from the monthly fallout collection network, all data have been transcribed to punched cards. To accomplish this transcription several rigid criteria were applied to the data. One condition was that only monthly data were punched onto the cards. The data printed out from the punched cards are presented in tables. Data are given on the following: (A) Sr-90 and Sr-89 in Monthly Deposition at World Land Sites; (B) Radionuclides and Lead in Surface Air; (C) Radiostrontium in Milk and Tap Water; (D) Table of Conversion Factors; (E) Table of Radionuclides. (See also W74-05174) (Houser-ORNL)
W74-05175

LOW-LEVEL RADIOACTIVITY MEASUREMENTS,
National Bureau of Standards, Washington, D.C.
J. M. R. Hutchinson, W. B. Mann, and R. W. Perkins.
Nuclear Instruments and Methods, Vol. 112, p 305-318, 1973. 16 fig, 7 tab, 20 ref.

Descriptors: *Radioactivity, *Measurements, *Assay, *Water pollution, *Measuring instruments, Equipment, Research and development, Monitoring, Radioactive waste, Biological control, Ion transport, Nuclear explosions, Nuclear powerplants, Effluents, Radioisotopes, Public health, Meteorology.

Low-level radioactivity measurements are reviewed. Alpha- and beta-particle, and Gamma-ray low-level-radioactivity counting is discussed, and various detector systems are compared for detection sensitivity. Low-level measurements on bovine liver standard reference material, and radioactive contamination in industrial samples of aluminum, copper, and steel are reviewed. The results of low-level radioactivity intercomparisons are discussed. Intercomparison studies are made from separate sea-water samples and spiked samples from Lake Michigan. (Houser-ORNL)
W74-05178

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W74-05189

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
J. F. Gamble.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 133-139, (1971) 1 fig, 3 tab, 26 ref.

Descriptors: *Cesium, *Recycling, Ecology, *Radioecology, Absorption, Milk, Fallout, *Ecosystems, *Florida, Cycles, Cycling nutrients, Food chains, Soils, Fertility, Nutrients, Forests, Radioactive tracers, Tracking techniques, *Path of pollutants.

Cesium-137 levels in Florida milk samples are five to six times higher than the United States average. There is no evidence to suggest that Florida has received unusually high amounts of fallout. The elevated levels are attributed to ecological concentration factors. Preliminary data of ecosystem compartments, part of a larger, detailed program, indicate that the mechanism responsible for the high, continued Cs-137 activity in the Florida biosphere is a combination of cycling within the plant vascular system and a mycorrhizal-plant root association that transfers nutrients directly from litter to the plant. The efficiency of the recycling is enhanced by the low natural fertility of the soils. The nature of the recycling is such that losses of cesium occur primarily in the fruit. In certain grazing situations, higher levels in beef and milk can be explained by the ingestion of palmetto fronds, palmetto berries, and acorns. A Cs-134 tracer study is described, and data are presented for Cs-137 levels found in selected soil and plant compartments from a sand pine-scrub oak community (Pinus clausa-Quercus chapmanii, Q. geminata, Q. myrtiflora) and from a mixed hardwood stand in north central Florida. (See also W74-05181) (Houser-ORNL)
W74-05192

CYCLING OF STABLE CESIUM IN A DESERT ECOYSTEM,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05195

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
A. Danielsson, B. Ronnholm, L.-E. Kjellstrom, and F. Ingman.
Talanta. Vol 20, No 2, p 185-192, 1973. Illus.
Identifiers: *Fluorometric methods, Natural waters, *Uranium, *Ion exchange, *Pollutant identification, Organic matter.

A method is described for the fluorimetric determination of U in natural waters. The limit is 0.3 ppm. Ion-exchange is used to preconcentrate the U by a factor of 22 and separate it from quenching ions in the sample. The fluorescence is measured in a medium that is 1.35 M in both sulfuric and phosphoric acids. The uranyl ions are excited by radiation of wavelength 280 nm and bandwidth 40 nm. The emitted signal is scanned from 470-510 nm. After spiking of the sample solution with a small volume of standard U solution, the fluorescence signal is scanned again and the U content of the sample calculated from the 2 readings. The coefficient of variation is 8.5% for determinations of U in a synthetic water sample having a U content of 1.9 ppm. Destruction of organic matter in the eluates gives 0.1 ppm detection limit.--Copyright 1973, Biological Abstracts, Inc.
W74-05240

NEW ULTRAVIOLET RATIO SPECTROPHOTOMETRIC SYSTEM FOR THE DETERMINATION OF TRACE AMOUNTS OF PHENOLIC COMPOUNDS,
Villanova Univ., Pa. Dept. of Chemistry.
J. E. Fountaine, P. B. Joshipura, P. N. Keliher, and J. D. Johnson.
Analytical Chemistry, Vol 46, No 1, p 62-66, Jan 1974. 3 tab, 5 fig, 23 ref.

Descriptors: *Analytical techniques, *Water analysis, *Phenols, *Pollutant identification,

*Spectrophotometry, Ultraviolet radiation, Alkalinity, Colorimetry, Color reactions.
Identifiers: Bathochromic shift, ASTM standards, Aminoantipyrine, Cresols, Thymol, Resorcinol, Tyrosine, Microanalysis, Trace analysis.

A newly developed instrument is described which uses two conventional sealed hollow cathode lamps to monitor the UV bathochromic shift that occurs when phenolic compounds are alkalized. This UV ratio spectrophotometer has been used to determine ppb amounts of phenol, o- and p-cresols, resorcinol, thymol, p-methoxyphenol, tyrosine, and similar phenolic derivatives. The UV ratio method generally gives results that are higher than those obtained in colorimetry with 4-aminoantipyrine (ASTM Standard Method D-1783-70), because para-blocked phenols do not react with 4-aminoantipyrine. Among other advantages of the new method is the relatively small sample size required, viz., 50 ml, compared to the 500 ml demanded by the ASTM procedure. (Brown-IPC)
W74-05244

PCB RESIDUES IN PLANKTON FROM THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. M. Ware, and R. F. Addison.
Nature, Vol 246, No 5434, p 519-521, Dec. 21/28, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Plankton, *Polychlorinated biphenyls, *Pollutant identification, *Particle size, Air pollution, Sea water, Water pollution, Sampling, Aquatic microorganisms, Diatoms, *Canada, Atlantic Ocean.
Identifiers: Prince Edward Island, Nova Scotia, *Gulf of St. Lawrence.

Concentrations of polychlorinated biphenyls (PCB) found in nine standard-net samples of plankta, collected at 10-day intervals from June to Aug. 1972 about 16 km offshore from the northern coast of Prince Edward Island, were found to be inversely related to particle size. This trend persisted despite a 34-fold difference in residue levels between composite samples, indicating that contaminant acquisition is directly proportional to particle surface area. However, spatial and temporal variations in contaminant supply tend to alter the PCB concentratiion vs. particle size relationship. Evidence indicated that PCB are transported from the atmosphere to the sea surface and thence to a plankton. (Brown-IPC)
W74-05256

NEW MEASURING METHODS FOR EVALUATING WASTE WATER QUALITY (NEUERE MESSVERFAHREN ZUR BEURTEILUNG DER ABWASSERQUALITAET),
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
E. Petermann.
Das Papier, Vol 26, No 10A, p 628-631, 635-637, Oct. 1972. 2 fig, 26 ref. English summary.

Descriptors: *Water quality control, Water analysis, Analytical techniques, Waste water(Pollution), *Pollutant identification, *Oxygen demand, *Suspended solids, *Color, *Oily water, Oil pollution, *Pulp wastes, Oil spills, Automation, Pesticides, Chemical oxygen demand, Biochemical oxygen demand, Colorimetry, Monitoring, Effluents, Pulp and paper industry.
Identifiers: Biocides, Permanganate number test.

Methods in use by the pulp and paper industry to evaluate the quality (or polluting effect) of effluent waters are critically assessed, and the need for additional methods is pointed out. Oxygen demand is being evaluated by 5-day BOD, COD, and permanganate number. In addition, most mill effluents are being tested for settleable solids, undissolved (suspended) solids, color, and oil content. The possibilities of automating various test methods are discussed. Disturbances in the 5-day BOD determination caused by the presence of biocides are pointed out. (Wise-IPC)
W74-05259

'BAROVIBRA' BOD MEASURING APPARATUS (BAROVIBRA-BSB-MESSGERAET),
K. Muehleisen.
Der Papiermacher, Vol 22, No 1, p 10-11, Jan. 20, 1973. 4 fig.

Descriptors: *Biochemical oxygen demand, Equipment, *Monitoring, *Industrial wastes, *Instrumentation, Measurement, Waste water(Pollution), *Pollutant identification.
Identifiers: Barovibra BOD monitor.

A highly automated electric instrument for measuring the BOD of effluent samples is described. The apparatus is especially suited for monitoring of industrial waste waters. It is easy to operate and gives reasonably accurate results in a short time. Typical data obtained are given and compared with those derived by other methods. (Speckhard-IPC)
W74-05265

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 111-116 (Technical Paper T303), Sept. 1973. 4 fig, 5 tab, 18 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Pollutant identification, *Toxicity, *Bioassay, Fish, Analytical methods, *Ion exchange, Resins, Cations, Heavy metals, Iron, Copper, Zinc, Chromium, Chlorine, Salmon, *Sockeye salmon, Effluents, Industrial wastes, Water pollution sources, Pulp and paper industry.
Identifiers: Veratrole, Kraft mills, Chlorine compounds, Dehydroabietic acid, Fatty acids, Carboxylic acids, Resin acids.

Toxic organic compounds were isolated from effluents of a bleached kraft mill by a new method, using Amberlite XAD-2 and DEAE-SEPHADEX A-25 ion-exchange resin columns from which organic solutes could be recovered without chemical changes. Bioassays on isolates of different history showed that the mortality of fish (sockeye salmon) was related to the resin acid content of effluents. Resin acids were toxic to young salmon at 2 ppm concentrations in static assays. Dehydroabietic acid was used as a standard reference compound, because of its superior chemical stability. Neutral fractions were nontoxic. Separation of a toxic fraction into its fatty acid and resin acid components indicated that both were toxic. The only chlorinated compound detected was trichloroveratrole (in minor yield). Heavy metals, such as Fe, Cu, Zn, and Cr, made negligible contributions to effluent toxicity. (Brown-IPC)
W74-05270

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
J. C. Sheppard, G. S. Clifton, and G. A. Grant.
Available from the National Technical Information Service as RLO-2221-T3-3, $4.00 in paper copy, $1.45 in microfiche. Research Report No 73/18/6. February 1, 1973. 33 p, 1 tab, 15 fig, 4 ref. RP 1111, AEC contract AT(45-1)-2221 Task 3.

Descriptors: *Pulp and paper industry, *Radioactivity techniques, *Monitoring, *Additives, Chemicals, Analytical techniques, Pollution abatement, *Water pollution sources, *Neutron activation analysis, Radioisotopes, Tracers, Pigments, Beryllium, Zinc radioisotopes, Titanium, Waterproofing, Polymers, Carbon radioisotopes, Microscopy, Tagging, Trace elements.
Identifiers: Coulomb scattering, Rutherford scattering, Americium, Californium, Zinc oxide, Titanium dioxide, Aquapel, Kymene, Alkyl letene dimers, Sizing agents, Wet strength agents, Waterproofing agents, Microtome sectioning, Pulp mills, Paper mills, Papermaking.

The technique of tagging paper additives with metal ions and complexes was found to have serious limitations. Some additives, such as Kymene (a polyamide-epichlorohydrin wet-strength resin) and Aquapel (an alkyl ketene dimer derived from long-chain fatty acids, used as waterproofing and sizing agent), are sufficiently important to papermaking and pollution control to warrant studying their behavior by tagging with carbon-14. Microtome sectioning plus neutron activation was shown to be a powerful tool in determinations of additive distributions in papers. Another technique of potential utility involves Rutherford or coulomb scattering of charged particles from the paper surface. Neutron activation was used to determine the fate of titanium dioxide and zinc oxide fillers or pigments under actual industrial conditions in a paper mill. This method, too, has considerable utility for observing the path of trace metals in paper mill environments. Such studies will help pulp mills in minimizing the loss of costly chemicals and, simultaneously, the discharge of harmful pollutants. A 30-curie neutron source of americium-241 plus beryllium was shown to have limited use in paper mill experiments. However, a higher-flux source of californium-252 may have potential process-control applications, such as the in-line monitoring of clay and titanium dioxide concentrations. (Brown-IPC)
W74-05287

SPECTROPHOTOMETRIC DETERMINATION OF LOW LEVELS OF MONO-, DI-, AND TRIETHYLENE GLYCOLS IN SURFACE WATERS,
Laboratory of the Government Chemist, London (England). Dept. of Trade and Industry.
W. H. Evans, and A. Dennis.
The Analyst (Journal of the Society for Analytical Chemistry), Vol 98, No 1172, p 782-791, Nov 1973. 6 tab, 23 ref.

Descriptors: *Water analysis, *Pollutant identification, *Alcohols, *Carbohydrates, *Organic compounds, Analytical techniques, Oxidation, Spectroscopy, *Spectrophotometry, Color, Colorimetry.
Identifiers: Glycols, Aldehydes, Ethylene glycol.

The method described involves oxidation of glycols to aldehydes with acidified potassium permanganate solution, followed by reaction with 3-methylbenzothiazol-2-one hydrazone to produce green cationic chromogens which are then measured spectrophotometrically at 630 nm. Omitting the oxidation step gives blank samples to compensate for natural interferences. With glycol recoveries of 1-5 mg/liter at precisions of plus or minus 7% from several water samples, the method was sensitive to 0.5 mg glycol/liter. A more sensitive variation of the method for monoethylene glycol alone is also described. (Brown-IPC)
W74-05290

THE QUANTITATIVE DETERMINATION OF CHROMIUM IN URINE BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY,
Erlangen-Nuremberg Univ. (West Germany).
K. H. Schaller, H.-G. Essing, H. Valentine, and G. Schacke.
Atomic Absorption Newsletter, Vol 12, No 6, p 147-150, November-December 1973. 3 fig, 2 tab, 18 ref.

Descriptors: *Chemical analysis, *Urine, *Chromium, Methodology, Heavy metals, Pollutant identification, Reliability, Trace elements, *Spectrophotometry.
Identifiers: *Body fluids, Flameless atomic absorption spectrophotometry, Biological samples, Chemical recovery, Precision, Detection limits, Absorbance.

Flameless atomic absorption spectrophotometry is considered to be the most suitable method for the determination of chromium in body fluids. This method has been applied to the direct determination of the chromium content of urine. Fifty microliters of a 24-hr urine sample are injected into an electrically heated graphite tube and the determination made at 358 nm. No prior sample preparation is required. To check the accuracy of the method, 5 micrograms/l Cr was added to urine samples not previously exposed to chromium. The median recovery was 93 percent. To determine precision in a series, one urine sample was analyzed twenty times. With a median chromium concentration of 6.02 micrograms/l and a standard deviation of 0.9 microgram/l, the coefficient of variation was equal to 15 percent. The precision from day-to-day, over the course of one week, expressed as the coefficient of variation was 17 percent at the 6-microgram/l level. The detection limit (equivalent to 1 percent absorption) was 0.2 microgram/l chromium in urine using a sample quantity of 50 microliters, equivalent to 10 pg of chromium absolute. (Holoman-Battelle)
W74-05291

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
R. D. Ediger.
Atomic Absorption Newsletter, Vol 12, No 6, p 151-157, November-December 1973. 88 ref.

Descriptors: *Water analysis, Methodology, *Heavy metals, *Alkaline earth metals, *Alkali metals, *Reviews, Pollutant identification, *Chemical analysis, Filtration, Water sampling, Trace elements, Aluminum, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Surface waters, Sodium, Zinc, *Spectrophotometry.
Identifiers: Atomic absorption, Spectrophotometry, Natural waters, Sample preparation, Sample preservation, Sample storage, Preconcentration, Direct flame atomization, Graphite furnace, Delves cup method, Gaseous hydrides, Arsenic, Selenium, Thallium, Tin, Vanadium, Silver, Detection limits.

A review is presented of the analysis of water samples by atomic absorption. A brief summary of preservation and storage methods is presented, along with information on some of the more useful concentration methods and specialized atomization techniques. Each element of major interest in water quality analysis is considered separately and typical analytical procedures are discussed. (Holoman-Battelle)
W74-05292

A TECHNIQUE FOR EXTRACTION AND STORAGE OF WATER SAMPLES FOR MN, CD, AND PB DETERMINATION BY ATOMIC ABSORPTION SPECTROSCOPY,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
R. D. Olsen, and M. R. Sommerfeld.
Atomic Abosorption Newsletter, Vol 12, No 6, p 165-166, November/December 1973. 1 tab, 7 ref.

Descriptors: *Solvent extractions, *Manganese, *Cadmium, *Lead, Methodology, Chemical analysis, Water analysis, Trace elements, Stability, Heavy metals, Separation techniques, Cobalt, Chromium, Copper, Iron, Nickel, Zinc, *Spectrophotometry.
Identifiers: *Metal chelates, Atomic absorption spectrophotometry, Sample storage, Methyl isobutyl ketone.

A method has been developed for stabilizing metal chelates thus allowing extracted metals to be stored for at least 2 weeks at room temperature in an acetone-HC1 solution. The stability is attained when the metal chelates are transferred from methyl isobutyl ketone to the acetone-HC1 solution. Other limited tests indicate that Co, Cr, Cu, Fe, Ni, and Zn may also be coextracted and stored in acetone-HC1 with similar stability. Some signal enhancement associated with MIBK solutions is also retained with the acetone-HC1 solution. This technique should permit greater time flexibility in atomic absorption analysis involving multi-element organic extractions of large numbers of water samples. (Holoman-Battelle)
W74-05293

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
I, Lysyj.
Environmental Science and Technology, Vol 8, No 1, p 31-34, January 1974. 3 fig, 2 tab, 2 ref.

Descriptors: *Water analysis, *Monitoring, Waste water(Pollution), Mathematical studies, Gas chromatography, Organic matter, Statistical methods, Computer programs, Industrial wastes, Water quality, Water pollution, Degradation(Decomposition), Textiles, Pulp wastes, Poultry, Streams, Waste identification, Water pollution sources.
Identifiers: *Pyrographic analysis, Pattern recognition, Thermal decomposition, Pyrolysis, Characterization.

Based on the theory of multicomponent pattern recognition and differentiation, a new analytical approach represents a fundamental departure from the traditional working concept of analytical chemistry. Multicomponent pattern recognition permits definition of a complex chemical composition as a separate entity, and provides means for studying its interactions with other compositions found in environmental matrices. In the pyrographic method, organic matter is subjected to elevated temperatures in the absence of oxygen, leading to thermal decomposition of organic molecules into several preferential fragments. The nature and quantity of such fragments reflect the elemental and structural character of the parent material. Through identification of the pyrolytically produced derivative composition by means of gas chromatography, the nature of the parent material can be defined. By comparing pyrograms of unknown matter with that of known materials, the qualitative nature of the substance in question could be determined. Analysis of water samples is performed automatically. No sample preparation, such as extraction or separation, is required. Interpretation of data is aided by two computer programs. The technique has been studied and evaluated in waste source identification and differentiation, industrial effluent analysis, control of waste treatment process, characterization of organic content of natural waters, and process control in beer brewing and other fields. Its use for stream monitoring, industrial effluent analysis, and waste treatment control are discussed. (Mortland-Battelle)
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-05295

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. B. Upchurch, J. K. Edzwald, and C. R. O'Melia.
Environmental Science and Technology, Vol 8, No 1, p 56-58, January 1974. 6 fig, 14 ref.

Descriptors: *Phosphates, *Bottom sediments, *Phosphorus, Freshwater, *Estuarine environment, Mixing, Saline water-freshwater interfaces, Methodology, Inflow, Estuaries, Chemical analysis, Bottom sampling, Aquatic environment, Suspended solids, *North Carolina, Suspension, Sediment transport.
Identifiers: *Pamlico Estuary(N.C.), Pamlico River, Sample preparation.

Of concern is the amount of available phosphorus present in the bottom sediments of North Carolina's Pamlico Estuary along the length of the estuary from a freshwater to an estuarine environment. Bottom sediments were collected at 23 sites from the middle of the Pamlico River with an Ekman dredge. The sediments were frozen, thawed, mixed, dried in an oven at 110 C for 24 hr, and ground. A modified HC1-H2SO4 extraction procedure was used to extract the available phosphorus from the sediments. After extraction, the phosphorus was measured using the vanadomolybdophosphoric acid colorimetric method. The amount of 'available' phosphorus extracted from sediment samples along the 35-mile length of the Pamlico Estuary, was observed to decrease from 1.6 mg P/g sediment in freshwater to 0.3 mg P/g sediment in water with a salinity of 18 ppt. A high correlation (r equals 0.99) between available phosphorus and oxalate-extractable iron was found in the upper reach of the estuary (salinity less than 1 ppt). In the lower part of the estuary the Fe-P correlation decreased (r equals 0.86). The decrease in the available P and in the Fe-P correlation along the length of the estuary is consistent with the suggestion that P is held to suspended sediments by some type of Fe-inorganic P complex of limited stability. Suspended materials entering the estuary in the freshwater inflow could lose phosphorus to solution as they are transported through waters of increasing salinity to the mouth of the estuary. (Holoman-Battelle)
W74-05296

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
R. J. Epler.
Environmental Science and Technology, Vol 8, No 1, p 28-30, January 1974. 1 fig, 1 tab.

Descriptors: *Digital computers, *Data processing, *Monitoring, *Water pollution, *Water quality, Pollutant identification, Automation, X-ray fluorescence, Nuclear magnetic resonance, Instrumentation, Thermal pollution, Radioactive wastes, Magnetic resonance, Water temperature, Hydrogen ion concentration, Electrical conductance, Dissolved oxygen, Oxidation-reduction potential, Gas chromatography, Spectrophotometry, Data collections.
Identifiers: Minicomputers, Analog to digital converters, Microwave spectroscopy.

Many analytical techniques suitable for use in pollutant monitoring lend themselves to use with computers: X-ray fluorescence, microwave spectroscopy, and nuclear magnetic resonance (nmr). Other instrumentation, too, can be used effectively in conjunction with computers. Much of the instrumentation used to monitor pollution can be tied to a computer through appropriate interfacing. Suppose a system is needed to monitor the following parameters in surface water, temperature, pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, and chloride content. To analyze these parameters in detail, and particularly to interrelate them, would be a difficult task liable to human error. A computer system could be developed that would perform all of these opera-

tions easily, and at the same time, present a total picture. The minicomputer is a key to such a system because it is small, inexpensive, and tolerant of a wide variety of environmental conditions. As an example, the PDP-8/F minicomputer is used as the central element of the system. Each instrument used in the system, such as a pH meter or a conductivity meter, produces an electrical signal that is proportional to the parameter being measured. For the computer to use these signals, two things are necessary: First, the hardware must convert the signals into a form that the computer can use, and second, correct programming must be used. To convert alalog signals into digital form, a converter (ADC) is used, aided by instrumentation-grade analog amplifiers, if necessary. Such a system in a laboratory lends itself to other types of instrumentation, such as gas chromatography, spectrophotmetry, and infrared and ultraviolet spectrometry. (Mortland-Battelle)
W74-05297

THE ULTRASTRUCTURE OF AN ALLOPARASITIC RED ALGA CHOREOCOLAX POLYSIPHONIAE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W74-05299

POLYCHLORINATED BIPHENYLS IN THE SEASTAR ACANTHASTER PLANCI,
Walla Walla Coll., College Place, Wash. Dept. of Biology.
L. R. McCloskey, and K. H. Deubert.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 261-264, November 1973. 2 fig, 4 ref.

Descriptors: *Polychlorinated biphenyls, *Pesticide residues, *Gas chromatography, Separation techniques.
Identifiers: *Starfish, Cleanup, Tissue, Echinoderms, Gas liquid chromatography, Thin layer chromatography, Electron capture gas chromatography, Nitration, Biological samples.

Procedures for separating PCB in small amounts of gonad tissue specimens from the starfish Acanthaster planci are described. Cleanup was done using disposable Pasteur pipettes. The columns were filled with Florisil activated for 24 hours at 130 C. Columns were packed in petroleum ether (30-60 C) and washed with 20 ml of petroleum ether prior to use. Extracts equivalent to one to two grams of fixed tissue were used for cleanup and PCBs were eluted with a volume (5-7 ml) of petroleum ether (30-60 C) that eluted 1 microgram of Aroclor 1254 to approximately 96 percent. A solvent blank was run with each extraction. Eluates were concentrated to 0.5 ml, and 1- to 5-microliter aliquots were analyzed by GLC-EC. TLC analysis was also carried out. Nitration of cleaned-up residues did not change the basic peak pattern, except to add new peaks. All tissue extracts produced peaks with the following retention times relative to p,p'-DDE: 0.45, 0.79, 1.0, 1.09, 1.35, 1.70, 2.14, 2.61, and 3.19. These peaks were also obtained with Aroclor 1254, and they did not disappear after nitration. TLC analysis of the extracts produced spots with R sub f values 0.72, 0.80, and 0.92, whereas Aroclor 1254 produced two overlapping spots. Approximate R sub f values were 0.7 and 0.8. The accuracy of the quantitation cannot be determined because of the differences between the peak patterns produced by Aroclor 1254 and the extracts. However, quantities estimated in this study seem to be in agreement with data obtained in similar studies on marine organisms. (Mortland-Battelle)
W74-05301

FIELD IONIZATION MASS SPECTROMETRY: A NEW TOOL FOR THE ANALYTICAL CHEMIST,
Stanford Research Inst., Menlo Park. Calif.
M. Anbar, and W. H. Aberth.
Analytical Chemistry, Vol 46, No 1, p 59-64, January 1974. 9 fig, 11 ref.

Descriptors: *Mass spectrometry, *Spectrophtometry, Ionization, Tracers, Isotope studies, Oil, Chemical analysis.
Identifiers: Field ionization, *Molecular tracers, Isotope dilution, No. 6 fuel oil, Oil characterization, Methaqualone, Phenobarbital, Norchlorpromazine.

Multipoint field ionization sources developed in recent years are discussed in detail and some new applications of mass spectrometry made possible by field ionization are reviewed. This technique provides nonfragmented and isotopically nonscrambled mass spectra which will open up at least two important areas of application: (1) analysis of complex multicomponent mixtures without preparation and (2) isotope dilution analysis by use of multilabeled molecular tracers. Field ionization spectra are shown for methaqualone, phenobarbital, norchlorpromazine, and No. 6 fuel oil. Field ionization mass spectrometry promises to provide a powerful tool in a diversity of fields including environmental research. (Mortland-Battelle)
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05304

ANODIC STRIPPING VOLTAMMETRY OF ZINC IN SEAWATER WITH A TUBULAR MERCURY-GRAPHITE ELECTRODE,
Naval Undersea Center, San Diego, Calif. Chemical Oceanography Branch.
S. H. Lieberman, and A. Zirino.
Analytical Chemistry, Vol 46, No 1, p 20-23, January 1974. 5 fig, 2 tab, 14 ref.

Descriptors: *Zinc, *Sea water, *Pollutant identification, Water analysis, Trace elements, Heavy metals, Chemical analysis, Measurement, Flow rates, Cadmium, Lead, Copper, Instrumentation.
Identifiers: *Anodic stripping voltammetry, *Tubular mercury-graphite electrodes, Detection limits, Precision, Accuracy, Mercury graphite electrodes, Reproducibility.

A tubular mercury-graphite electrode (TMGE) has been used to measure zinc in flowing solutions by anodic stripping voltammetry. Fabrication of the electrode and a new method of applying and maintaining a consistently active mercury thin film on a graphite electrode are described. Application of the TMGE to anodic stripping voltammetry of Zn in seawater yields peak currents that are linear with concentration. Measurements are reproducible with a relative standard deviation of plus over minus 9.5 percent at the 0.3 nM level. The system is more sensitive than a comparable static system. Five-minute analysis times permit detection of zinc in sea water at concentrations of 1 nM. The Zn peak current and trace metal peak potentials are described as a function of plating time, rate of solution flow, and other variables. (Holoman-Battelle)
W74-05305

CHARACTERIZATION OF WOOD-PRESERVING COAL-TAR CREOSOTE BY GAS-LIQUID CHROMATOGRAPHY,
Forest Service (USDA), Madison, Wis. Forest Products Lab.
F. H. M. Nestler.
Analytical Chemistry, Vol 46, No 1, p 46-53, January 1974. 3 fig, 6 tab, 12 ref.

Descriptors: *Creosote, *Wood preservatives(Pesticides), *Coal tar coating, Physical properties, Gas chromatography, Aromatic compounds, Organic compounds, Methodology, Distillation, *Chromatography.
Identifiers: Characterization, *Gas liquid chromatography, Retention time, Aromatic hydrocarbons, Precision, Boiling point, Naphthalene, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyls, 2 6-Dimethylnaphthalene, 2 3-Dimethylnaphthalene, Carbazole, Acridine, Acenaphthene, Dibenzofurans, Fluorene, Phenanthrene, Anthracene, 2-Methylanthracene, 9-Methylanthracene, 2-Phenylnaphthalene, Fluoranthene, Pyrene, 2 3-Benzofluorene, Chrysene, n-Eicosane.

Six whole coal-tar creosotes, two of which represent contemporary commercial production, were analyzed by GLC on an SE-30 packing. Retention data for 14 standard compounds were determined for the four liquid phases: SE-30, ApL, OV-17, DEGS. The linear relationship observed between log relative retention in SE-30 and atmospheric boiling point permitted the quantitative interpretation of isothermal chromatograms in terms of a simulated distillation analysis. The latter results agreed very well with precision fractional distillation data, but much less so with the American Wood-Preservers' Association Standard Method. The boiling ranges selected for comparison of the three sets of data were those established for the AWPA Standard Method. (Holoman-Battelle)
W74-05306

USE OF MULTIPLE R SUB F VALUES FOR IDENTIFICATION BY PAPER AND THIN-LAYER CHROMATOGRAPHY,
Wisconsin Univ. Madison. School of Pharmacy.
K. A. Connors.
Analytical Chemistry, Vol 46, No 1, p 53-58, January 1974. 7 fig, 2 tab, 37 ref.

Descriptors: *Chromatography, *Solvents, Statistical methods, Pollutant identification.
Identifiers: R sub f values, Paper chromatography, Thin layer chromatography.

This paper attempts to define how many chromatographic solvent systems should be used in identifying unknowns and how these systems should be selected. Maximum information from chromatography for qualitative analysis is obtained when the R sub fx value for a compound in system X is independent of its value R sub fy in another system Y. It is found, for such systems, that the distribution of points in the R sub fx, R sub fy plane is closed to a Poisson distribution. The number of independent R sub f values required to identify a compound at a specified level of uncertainty can be calculated. Independence of R sub f values is enhanced by using chromatographic systems that are qualitatively different from each other. In many analytical situations, the analyst might make planned use of the considerations presented in this paper. A rough estimate of the size of the population can usually be made. The nature of the distribution of points in the R sub fx, R sub fy plane can be established experimentally, and application of the above guideline experimentally, and application of the above guideline may lead to efficient selection of uncorrelated systems. (Mortland-Battelle)
W74-05307

INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION ANALYTICAL SPECTROMETRY. A COMPACT FACILITY FOR TRACE ANALYSIS OF SOLUTIONS,
Ames Lab., Iowa.
R. H. Scott, V. A. Fassel, R. N. Kniseley, and D. E. Nixon.
Analytical Chemistry, Vol 46, No 1, p 75-80, January 1974. 8 fig, 3 tab, 35 ref.

Descriptors: *Heavy metals, *Aqueous solutions, *Laboratory equipment, *Trace elements, *Spectroscopy, Water analysis, Aluminum, Calcium, Cobalt, Chromium, Nickel, Lead, Titanium, Zinc.
Identifiers: Plasma-optical emission spectroscopy, Detection limits, Barium, Selenium, Vanadium, Yttrium, Trace levels.

This paper describes a compact inductively coupled plasma-optical emission system for the trace determination of metallic elements in solution. Theoretical considerations are presented to determine operating parameters which agree well with the empirically determined values. The aerosol desolvation system commonly used with this type of source has been eliminated, and pneumatic nebulization is employed in place of the more elaborate ultrasonic method. Some characteristics of the plasma are reported. Detection limits are in the range of 0.1-10 mg/ml for A1, Ba, Ca, Co, Cr, Ni, Pb, Se, Ti, V, Y, and Zn. The facility is readily adaptable to simultaneous multielement trace analysis. (Little-Battelle)
W74-05309

PRESERVATION OF DILUTE MERCURY SOLUTIONS,
Oak Ridge National Lab., Tenn.
C. Feldman.
Analytical Chemistry, Vol 46, No 1, p 99-102, January 1974. 9 fig, 1 tab, 9 ref.

Descriptors: Water storage, *Mercury, *Stability, Water analysis, Aqueous solutions, *Pollutant identification.
Identifiers: *Sample preservation, *Chemical loss, Reference samples, Losses.

Distilled water solutions containing 0.1-10.0 ng Hg/ml were stored for 10 days in glass and polyethylene containers. Those which were untreated, or treated with nitric acid, sulfuric acid plus potassium permanganate, or potassium chromate, lost substantial fractions of their mercury in this period. Solutions stored in polyethylene and treated with 5 percent (v/v) nitric acid plus 0.05 percent chromate ion stayed at full strength for at least ten days. Solutions stored in glass and treated with 5 percent (v/v) nitric acid plus 0.01 percent chromate ion stayed at full strength for as long as five months. The causes of losses in distilled and natural water samples are discussed. (Little-Battelle)
W74-05310

SOLVENT EXTRACTION OF METAL CHELATES INTO WATER-IMMISCIBLE ACETONE,
Kentucky Univ., Lexington. Dept. of Chemistry.
C. E. Matkovich, and G. D. Christian.
Analytical Chemistry, Vol 46, No 1, p 102-106, January 1974. 5 fig, 4 tab, 15 ref.

Descriptors: *Separation techniques, *Solvent extractions, *Aqueous solutions, *Heavy metals, Solvents, Water analysis, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Titanium, Chelation.
Identifiers: Scandium, *Metal, Chelates.

Acetone is separated from aqueous solutions via salting-out with either saturated calcium chloride or 65 wt percent sucrose. Several metal ammonium l-pyrrolidinecarbodithioate and dithizone chelates were successfully extracted from calcium chloride solutions into the acetone phase while metal oxine chelates were extracted from sucrose solutions. Solvent extraction curves are reported. The metals considered include Sc, Cr, Mn, Fe, Co, Ni, Cu, Ti, and Zn. (Little-Battelle)
W74-05311

ESTERIFICATION OF (2,4-DICHLOROPHENOXY)ACETIC ACID - A QUANTITATIVE COMPARISON OF ESTERIFICATION TECHNIQUES,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
J. Horner, S. S. Que Hee, and R. G. Sutherland.
Analytical Chemistry, Vol 46, No 1, p 110-112, January 1974. 2 tab, 11 ref.

Descriptors: *2 4-D, Gas chromatography, Nuclear magnetic resonance, Chemical analysis, *Chlorinated hydrocarbon pesticides, Herbicides, Methodology.
Identifiers: *Sample preparation, *Esterification, Purity, *Gas liquid chromatography, Mass spectra, Infrared spectra, NMR spectra.

Esterification of 2,4-D with BF3/alcohol mixtures for gas chromatography produces esters in greater than 90 percent yield in 20 minutes with few byproducts. Diazoalkylation is also efficient but produces many impurities. In addition, the reagent is more difficult to make and is more labile than the BF3/alcohol mixtures. Mineral acid catalysis of 2,4-D/alcohol mixtures is time consuming and inefficient. The esters produced by silylation are unstable. The purity of the ester was determined by GLC analysis with thermal conductivity, flame ionization, and electron capture detectors. Mass, infrared, and NMR spectra of the pure compounds were used to confirm the presence of the prepared esters, and the identity of collected compounds separated by thermal conductivity GLC. Retention times of the prepared esters were compared with those of authentic esters. (Little-Battelle)
W74-05312

EFFECTS OF SURFACTANTS ON ATOMIC ABSORPTION ANALYSIS OF DILUTE AQUEOUS COPPER AND NICKEL SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
R. L. Venable, and R. V. Ballad.
Analytical Chemistry, Vol 46, No 1, p 131-133, January 1974. 4 fig, 7 ref.

Descriptors: *Aqueous solutions, *Copper, *Nickel, Stabilization, Surfactants, Chemical analysis, Heavy metals, *Spectrophotometry.
Identifiers: *Anionic surfactants, Atomic absorption spectrophotometry, Absorbance, Sodium dodecyl sulfate, Sodium lauryl sulfate, Tetradecylpyridinium bromide, Critical micelle concentration.

Dilute (approximately 3 micrograms/ml) Cu and Ni solutions were analyzed by atomic absorption spectrophotometry upon the addition of the anionic surfactant, sodium dodecyl sulfate (SDS). One effect was the enhancement of absorption in acidic copper and nickel solutions containing SDS above the critical micelle concentration (CMC) over the same acidic copper and nickel concentrations without surfactant present. The second effect seemed to be either prevention of precipitate formation or stabilization of a colloidal dispersion in basic solutions at surfactant concentrations approaching and above the CMC. It was concluded that certain anionic surfactants can cause erroneous results in the AAS analysis of dilute aqueous metal ion solution. However, SDS and maybe other such surfactants can potentially be used to keep metals in solution where acidic pH values are not tolerable. (Holoman-Battelle)
W74-05313

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
A. Di Corcia, and R. Samperi.
Analytical Chemistry, Vol 46, No 1, p 140-143, January 1974. 4 fig, 1 tab, 14 ref.

Descriptors: *Aqueous solutions, *Gas chromatography, Separation techniques, Organic, Acids, Water analysis, Distillation, *Pollutant identification.
Identifiers: *Fatty acids, Acetic acid, Propionic acid, Isobutyric acid, Butyric acid, 2-Methylbutyric acid, 3-Methylbutyric acid, Valeric acid, Flame ionization detector, Graphitized carbon black, Polyethylene glycol, Phosphoric acid.

An improved chromatographic method is reported for the rapid determination of aqueous solutions of the seven acids at concentrations down to 0.3 ppm, using Graphitized Carbon Black (GCB) modified with appropriate amounts of H3PO4 and polyethylene glycol 20 M. Column packings were prepared by dissolving appropriate amounts of the two phases, H3PO4 and polyethylene glycol (PEG) 20 M (Carlo Erba), in methanol and coating on the GCB by a slurry technique. Methanol was removed with use of a heat lamp. While drying, stirring of these materials must be avoided, as it may cause in some measure crushing of the graphitized carbon particles. Dried materials were revieved to maintain the proper mesh range. Columns made from glass tubings whose dimensions are specified in the captions of the figures were packed by moderately vibrating with the aid of a vibrator. The first four centimeters of the inlet side of each column were left empty to use them as an expansion chamber for injected liquid samples. Columns were then conditioned for 24 hours at 240C. Using a suitably modified GCB surface allows quantitative determinations of C2-C5 acids to be made quite easily even at sub-ppm concentrations. The effect of adding PEG-20 M is twofold: first, it neutralizes residual 'hot sites' and, second, it reduces the surface area available for adsorption of eluate molecules, thus decreasing retention times. (Mortland-Battelle)
W74-05314

ANALYSIS OF PRIMARY AROMATIC AMINES AND NITRITE BY DIAZOTIZATION AND PYROLYSIS GAS CHROMATOGRAPHY,
Massachusetts Univ., Amherst. Dept. of Chemistry.
A. Savitsky, and S. Siggia.
Analytical Chemistry, Vol 46, No 1, p 153-155, January 1974. 3 tab, 13 ref.

Descriptors: *Gas chromatography, *Nitrites, *Aromatic compounds, Water analysis, Aqueous solutions, Pollutant identification.
Identifiers: *Aromatic Amines, *Diazotization, *Pyrolysis gas chromatography, Diazonium salts, Anisidine, Sodium sulfanilate, Metanilic acid, Anthranilic acid, Aminobenzoic acid, Benzidine, Diphenyl amine sulfonic acid, Methyl amine, Phenyl anthranilic acid, Triphenyl amine, Diethyl amine, Accuracy, Precision, Chemical interference.

A pyrolysis gas chromatographic method for analysis of diazonium salts has recently been developed. Since only primary aromatic amines produce stable diazonium salts upon diazotization and only diazonium salts should liberate nitrogen upon mild pyrolysis, adaptation of the pyrolysis gas chromatographic method has been investigated as a specific method for measuring primary aromatic amine content of mixtures. The feasibility of the pyrolysis gas chromatographic technique was demonstrated by analysis of primary aromatic amines of known purity. The percent recoveries by pyrolysis indicate that diazotization proceeds quantitatively and that the manipulation of the diazonium salts preserves them for analysis. Low, though reproducible, results were obtained

for benzidine. Generally the precision and accuracy of the analysis was on the order of 1-2 percent. The analysis of mixtures for primary aromatic amine content was carried out by diazotizing in platinum boats. This was necessary because of insolubility of the products of some secondary and tertiary aromatic amines. The ability of pyrolysis gas chromatography to selectively determine the diazonium salts produced upon reaction with nitrous acid was demonstrated. Analysis of nitrite in nitrate required special modification of the diazotization conditions. Anthranilic acid was chosen for diazotization because its diazonium salt has good water solubility. (Mortland-Battelle)
W74-05315

SPATIAL VARIABILITY OF THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANGMUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5C.
W74-05318

SETTLING PLATES OF COLD-CURE ACRYLIC PLASTIC REPLICATED FROM NATURAL SURFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
M. J. Risk.
Limnology and Oceanography, Vol 18, No 5, p 801-802, September 1973. 10 ref.

Descriptors: *Plastics, *Sampling, *Artificial substrates, Algae, Invertebrates, Biological communities.
Identifiers: *Settling plates, Formatray, Acrylics, Colonizing.

Many different substances have been used in the field and in the laboratory as substrates for colonizing communities of plants and animals. 'Formatray', a strong inert, cold-cure dental acrylic, seems to satisfy most of the requirements of an ideal settling plate material. Settling plates were made by pouring mixed Formatray into latex rubber impressions of various surfaces. Latex impressions can successfully be made of almost any natural surface. Formatray has about 40 percent calcium carbonate filler material and chemically approximates a calcareous sandstone or siltstone. A virtually unlimited number of plates can be poured up from one latex impression, thus allowing the operator to place identical plates in different locations or a series of plates, chemically identical and texturally different, in one location. In the field, plates are colonized rapidly and support heavy growths of algae and invertebrates. In a preliminary study in Big Fisherman's Cove, Santa Catalina Island, California, plates set out in shallow water picked up the most common algae settling on rocks in the area. So far, 41 species of algae and at least 11 species of invertebrates have been identified growing on these plates; there seems to be no selective exclusion of groups. (Mortland-Battelle)
W74-05319

PREPARATION OF FILTERED PLANKTON AND DETRITUS FOR STUDY WITH SCANNING ELECTRON MICROSCOPY,
California Univ., Davis. Inst. of Ecology.
H. W. Paerl, and S. L. Shimp.
Limnology and Oceanography, Vol 18, No 5, p 802-805, September 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Detritus, *Diatoms, *Electron microscopy, Dehydration, Filters, Lakes, Sea water, Sediments, Periphyton, Bacteria, Storage.
Identifiers: *Sample preparation, *Scanning electron microscopy, Sample preservation, Nuclepore filters, Lake Tahoe, Fixation.

A simple, rapid method of fixing plankton and detritus for the scanning electron microscope is described, which can be used in the laboratory or in the field. The sample is fixed with 2 percent glutaraldehyde followed by stepwise dehydration in increasing concentrations of ethyl alcohol. Fixed samples can be stored for up to 2 weeks. Critical point drying of the fixed samples is done in the laboratory. Nuclepore filters proved superior to other filters for most sample preparations. (Mortland-Battelle)
W74-05320

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 7B.
W74-05321

FISH VIRUSES: ISOLATION AND IDENTIFICATION OF INFECTIOUS HEMATOPOIETIC NECROSIS IN EASTERN NORTH AMERICA,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, M. C. Quimby, L. L. Pettijohn, and M. L. Landolt.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1625-1627, November 1973. 1 fig, 1 tab, 11 ref.

Descriptors: *Isolation, *Pollutant identification, *Fish diseases, Methodology, Testing procedures, *Rainbow trout, Viruses, Electron microscopy, Fish eggs, Fry.
Identifiers: *IHN virus, *Infectious hematopoietic necrosis, Histopathology, Salmo gairdneri, Plaque counts, Rhabdoviruses, Sample preparation.

Infectious hematopoietic necrosis virus (IHNV) was isolated from diseased fingerling rainbow trout (Salmo gairdneri) from a hatchery in West Virginia. Clinical signs, histopathologic findings, and origin of eggs provided a basis for diagnosis, and virus was isolated and presumptively identified by plaque characteristics. Serum neutralization tests provided positive identification of the agent as IHNV, and electron microscopy showed its rhabdovirus morphology. Experimental infections resulted in signs of IHNV and death; test fish had characteristic histopathologic alterations and appropriate virus titers. This is the first completely documented occurrence of IHNV beyond the Pacific Northwest. (Holoman-Battelle)
W74-05322

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
J. B. Gratzek, M. H. McGlamery, D. L. Dawe, and T. Scott.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1641-1645, November 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Cytological studies, *Assay, *Pollutant identification, Viruses, Channel catfish, Biochemistry, Fish diseases, Pollutants.
Identifiers: *Microculture methods, *Channel catfish virus, *Quantitative analysis, Brown bullhead, Cell cultures, Ictalurus nebulosus, Ictalurus punctatus, Antibodies, Plaque titration, Herpesviruses.

A microculture system was applied to the culture of brown bullhead (Ictalurus nebulosus) cells and used for the titration of channel catfish (Ictalurus punctatus) virus and corresponding antibody. As few as 17,000 cells/well could be used for routine titrations. Simultaneous inoculation of virus with cells at the time of planting resulted in clearer endpoints as opposed to inoculation of performed monolayers. When channel catfish virus antibodies were measured using plaque reduction and microculture titration assays as indicator systems, no significant differences in antibody titers were noted. (Holoman-Battelle)
W74-05323

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr., and J. S. Finley.
Marine Pollution Bulletin, Vol 4, No 11, p 172-176, November 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Marine animals, *Pollutant identification, *Oil pollution, Chemical analysis, Mussels, Organic compounds, Mollusks, Invertebrates, Bottom sampling, Gas chromatography, Separation techniques, Methodology, Baseline studies, Water quality.
Identifiers: *Trace levels, *Paraffins, *Petroleum hydrocarbons, Sample preparation, Data interpretation, Background levels, Hydrocarbons, Aliphatic hydrocarbons, Macroinvertebrates, Mytilus edulis, Mytilus californianus, Crude oil, Lubricating oil, No. 2 fuel oil, Fuel oil.

This paper describes how an analysis of the n-paraffin content and pattern can be used to delineate the accumulation of petroleum hydrocarbons in nature below levels of detectable odour or taste. It is possible to detect very low levels (less than 5 ppb individual n-paraffins n-14C3OH to n-37C76H) of paraffin hydrocarbons in intertidal marine organisms and to use these compounds with suitable baseline information for estimating the quantity of petroleum pollution uptake in the organisms. Under conditions of moderate to major oil pollution, this technique provides a calculation of residual paraffin hydrocarbon pattern in exposed organisms which can be compared to the pollutant hydrocarbon pattern. For low-level persistent pollution, the use of paraffin hydrocarbon patterns and content can often provide an indication of petroleum uptake but, in cases where the pollutant is low in paraffin hydrocarbons (lubricating oils, some crude oils, etc.) or where the rate of bacterial degradation is equivalent to the pollutant input different techniques of analysis are required. Exposed mussels (Mytilus spp.) collected under three differing degrees of suspected petroleum pollution are compared with unexposed control mussels: (1) 'high-level' pollution where a known pollutant was released in a single large discharge; (2) 'moderate-level' pollution where observable quantities of a known pollutant leaked over a long period; and (3) 'low-level persistent' pollution having multiple sources but no continuously visible oil slick on the water surface. (Holoman-Battelle)
W74-05326

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
J. Deufel.
Arch Hydrobiol Supple, Vol 44, No 1, p 1-9, 1972, English summary.
Identifiers: *Bacteria, *Germany(Danube River), *Sewage, Plate counts, Direct counts, Pollutant identification.

In the Berg Spring, and at 7 other stations of the Danube above Ulm, the number of bacteria counted by the direct method, and the number of heterotrophic, saprophytic bacteria were determined. Highest numbers could always be found during low water level below the outfalls of sewers. With the microscopic method numbers ranged from 1900/ml at Berg Spring to 36,000,000/ml at Tuttlingen, and with the plate count method from 49/ml to 640,000/ml at the same stations. The ratio direct count to plate count can be employed only with reservation to indicate the water quality. In spite of a high concentration of bacteria, the bacterial load is smallest at low water-level and highest during floods. Along the section of river investigated the bacterial load increases parallel to the rising flow.--Copyright 1973, Biological Abstracts, Inc.
W74-05362

THE DETERMINATION OF COBALT IN FISH TISSUE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Government Vitamin Lab., Bergen (Norway).
K. Julshamn, and O. R. Braekkan.
Atomic Absorption Newsletter, Vol 12, No 6, p 139-141, November-December 1973. 2 fig, 2 tab, 34 ref.

Descriptors: *Cobalt, *Chemical analysis, *Fish, Trace elements, Heavy metals, Freeze drying, Hydrogen ion concentration, *Spectrophotometry.
Identifiers: Animal tissues, *Atomic absorption spectrophotometry, Sample preparation, Chemical recovery, Detection limits, Precision, Ballan wrasse, Saithe, Sand eels.

A method is described for the determination of cobalt in fish. The samples were prepared for analysis by freeze-drying and homogenization. A portion of 10 g was pre-ashed with infrared heat and then ashed in a muffle furnace at 480C. The residue was dissolved in 0.1 N hydrochloric acid, chelated with ammonium pyrrolidine dithiocarbamate, extracted with methyl isobutyl ketone, and analyzed by atomic absorption spectroscopy. Levels down to 0.01 microgram cobalt per g of fish tissue may be estimated with an average recovery of 96 percent and a coefficient of variation of 5.7-14.2 percent. (Holoman-Battelle)
W74-05399

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05400

5B. Sources Of Pollution

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
D. E. Kidd, G. V. Johnson, and J. D. Garcia.
Available from National Technical Information Service as PB-228 587 $9.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report 035, University of New Mexico, Albuquerque, 1974, 125 p, 26 tab, 3 fig, 84 ref. OWRR A-040-NMEX(2).

Descriptors: *New Mexico, *Ecosystems, *Trophic levels, *Mercury, *Fish, Aquatic animals, Food chains, Fish diets, Zooplankton, Turtles, Crayfish, Freshwater fish, Bass, Channel catfish, Laketrout, Carp, Suckers, Walleye, Perches, Mussels, Organic matter, Spectrophotometry.
Identifiers: *Mercurials, *Elephant Butte Reservoir(N. Mex.), Bioamplification, Freshwater mussels, Nonvascular plants, Organic debris.

Samples from Elephant Butte Lake collections were analyzed for mercury by a flameless atomic absorption procedure. Analyses revealed mean ppb mercury concentrations of 0.027 in water, 57 in bottom sediments, 109 in phytoplankton, 277 in attached algae and bryophytes, 95 in plant debris, 69 in zooplankton, 90 in crayfish muscle, 26 in visceral mass of mussels, 97 in muscle of nonpredaceous fish, 125 in muscle of small predaceous fish, 253 in muscle of large predaceous fish, and 266 in muscle of two turtle species. Tissue grouped by relative levels for the sixteen fish species show consistently lower levels in bone, skin, gills, and eyes; intermediate levels in stomach, intestine, heart, and brain; and higher levels in spleen, muscle, kidney, and liver. General bioamplification at higher trophic levels appears to be diet related, but the relationship does not hold for lower trophic levels. Mercury levels in water indicate a decreasing gradient from inlet to dam, while sediments display an increasing gradient from inlet to dam. An attempt is made to account for concentrations in some higher trophic level species. Evidence suggests that mercury levels are related to seasonal conditions. A bioamplification scheme and concentration factors are presented which describe the status of mercury concentrations in existing trophic levels. The potential hazards of Elephant Butte fish to human health are discussed. (Hain-New Mexico)
W74-04859

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
R. W. Hill, E. K. Israelsen, and J. P. Riley.
Available from National Technical Information Service as PB-228 650 $4.75 in paper copy, $1.45 in microfiche. Report PRWG104-1, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, November 1973. 122 p, 18 fig, 3 tab, 54 ref, 6 append. OWRR B-065-Utah(1). 14-31-0001-3658.

Descriptors: *Simulation analysis, Management, *Salinity, *Forecasting, *Hydrologic systems, *Model studies, *Dissolved solids, Discharge(Water), Hydrology, Pollutants, Surface-groundwater relationships, *Utah, Water pollution, Surface waters, Water sampling, Data processing.
Identifiers: Dissolved solids models, Bear River basin(Utah).

Modeling concepts of the hydrologic system are based upon the development of basic relationships describing the hydrologic processes which are linked together by the continuity-of-mass principle. The salinity flow system is then linked to the hydrologic system based on the assumption that the various hydrologic processes change the chemical concentration in the system by storing, concentrating, diluting, and/or picking up additional salts. These processes are identified specifically for irrigated soils and for small storage reservoirs. The amount of storage dilution, concentration or additional pickup is specified during verification of the model. The system response is then used to predict future responses resulting from additional water resource uses. In this study the model was synthesized on the hybrid computer and applied to the Cache Valley subbasin of the Bear River basin. The ability of the model to predict increased salt concentrations is demonstrated. A method for estimating and filling data gaps is also briefly discussed.
W74-04860

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
For primary bibliographic entry see Field 5A.
W74-04871

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
K. L. Smith, Jr.
Ecology, Vol 54, No 5, p 1065-1075, Late Summer 1973. 4 fig, 3 tab, 39 ref.

Descriptors: *Respiration, Biological communities, *Littoral, *Marine animals, Marine bacteria, *Seasonal, Biomass, Benthic fauna, Sediments, Crustaceans, Mollusks, Dominant organisms, Annelids, Oxidation, Bottom sampling, Marine plants, Water temperature, Salinity, Dissolved oxygen, Carbon, Soil temperature, Aquatic soils, Invertebrates, Animal metabolism, Clams, Cores, Chemical reactions, *Georgia.
Identifiers: Sublittoral, *Oxygen consumption, Species diversity, *Sapelo Island(Geo), Species abundance, Nemerteans, Coelenterates, Sipunculids, Echinoderms, Hemichordates, Pogonophorans, Species density, Meiofauna, Species diversity index, Shannon-Weiner diversity index, Sample preparation, Correlation coefficients, Polychaetes, Anthozoans, Notomastus, Glycera dibranchiata, Nephthys picta, Mellita quinquiesperforata, Haliactus, Decapods.

Respiration of a sublittoral community was examined off Sapelo Island, Georgia, from July, 1969 through July, 1970. Total community respiration ranged from 53.7 ml 02/sq m/hr in January to 92.7 ml 02/sq m/hr in July. A positive correlation was found between community respiration and water temperature. Annual community respiration was estimated to be 676.6 liters 02/sq m/yr. The macrofauna consisted of 103 species representing ten phyla. Species abundance ranged from 744 individuals/sq m in July to 14,213 individuals/sq m in March. Biomass (ash free dry wt) increased from 7.3 g/sq m in October to 20.2 g/sq m in March. Macrofaunal respiration comprised from 5 to 26 percent of community respiration. Bacteria were the major functional component of the community accounting for 30 percent to 60 percent of the total respiration. Meiofaunal-microfaunal-microfloral respiration contributed from 25 percent to 58 percent of total community respiration. Sediment chemical oxidation was responsible for 2.8 ml 02/sq m/hr in January to 8.5 ml 02/sq m/hr in July of the total oxygen uptake. (Holoman-Battelle)
W74-04874

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-04882

SPECIES OF OCEANIC DINOFLAGELLATES IN THE GENERA DISSODINIUM AND PYROCYSTIS: INTERCLONAL AND INTERSPECIFIC COMPARISONS OF THE COLOR AND PHOTON YIELD OF BIOLUMINESCENCE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. Swift, W. H. Biggley, and H. H. Seliger.
Journal of Phycology, Vol 9, No 4, p 420-426, December 1973. 2 fig, 4 tab, 54 ref.

Descriptors: *Marine algae, *Dinoflagellates, *Bioluminescence, Protozoa, Biological properties, Color, Speciation, Phytoplankton, Cultures, Chemical analysis, Methodology, Carbon, Nitrogen, Plant growth.
Identifiers: *Clones, *Bioenergetics, Photon yield, Gonyaulax spp, Pyrocystis acuta, Pyrocystis fusiformis, Pyrocystis noctiluca, Pyrodinium bahamense, Dissodinium lunula, Luciferase.

An examination was made of the bioluminescence of 5 clones of Dissodinium, 1 clone of Pyrocystis acuta, 4 clones of Pyrocystis fusiformis, and 5 clones of Pyrocystis noctiluca. All clones produced the same color bioluminescence with an intensity peak near 474 nm. The in vivo emission spectra of these clones agreed with those previously determined for 4 other species of marine dinoflagellates. The amount of light emitted by the dinoflagellates in scotophase when mechanically stimulated to exhaustion was determined for most of the clones. The largest species, P. noctiluca and P. fusiformis, emitted 37-89 billion photons/cell and 23-62 billion photons/cell, respectively, about a thousand times as much light as Gonyaulax species. Pyrocystis acuta emitted 3-6 billion photons/cell. Three of the 5 clones of Dissodinium were bioluminescent. The range for 3 clones was 5-13 billion photons/cell. All 5 clones of Dissodinium are morphologically distinct. Both the clones of Dissodinium and Pyrocystis produced much higher numbers of photons per cell nitrogen (ca. 7-50 times) than Gonyaulax polyedra or Pyrodinium bahamense. The data suggested that enzyme turnover occurred in the reactions producing light during mechanical stimulation of Dissodinium and Pyrocystis species. (Holoman-Battelle)
W74-04883

CHLOROPHYLL, NITROGEN, AND PHOTSYNTHETIC PATTERNS DURING GROWTH AND SENESCENCE OF TWO BLUE-GREEN ALGAE,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-04884

DEGRADATION OF PARATHION BY BACTERIA ISOLATED FROM FLOODED SOIL,
Central Rice Research Inst., Cuttack (India). Dept. of Soil Microbiology.
R. Siddaramappa, K. P. Rajaram, and N. Sethunathan.
Applied Microbiology, Vol 26, No 6, p 846-849, December 1973. 3 tab, 13 ref.

Descriptors: *Alluvium, *Microbial degradation, *Pseudomonas, Soil bacteria, Phosphothioate pesticides, Nitrites, Isolation, Metabolism, Aerobic bacteria, Insecticides, Organophosphorus pesticides, Biodegradation, Hydrolysis, *Path of pollutants.
Identifiers: *Parathion, *Bacillus, *Fate of pollutants, Chemical recovery, p-Nitrophenol, Metabolites, Degradation products, Culture media, Flooded soil.

Bacillus sp. and Pseudomonas sp. were isolated from parathion-amended flooded alluvial soil which had demonstrated parathion-hydrolyzing ability. When Pseudomonas was incubated with 50 micrograms of parathion, 19 micrograms of p-nitrophenol was recovered within 4 h of incubation as the hydrolysis product. After 20 h parathion was completely destroyed and no p-nitrophenol could be detected. When Pseudomonas was grown in a N2-free medium with p-nitrophenol as the sole carbon source, nitrite-nitrogen was released in proportion to the amount of p-nitrophenol degraded. Bacillus sp. was incubated as above with 166 micrograms of p-nitrophenol being metabolized, releasing 43 micrograms of nitrite. The bacterium failed to metabolize intact parathion to yield either nitrite or p-nitrophenol. (Holoman-Battelle)
W74-04889

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
For primary bibliographic entry see Field 5A.
W74-04904

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04905

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 5D.
W74-04908

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5A.
W74-04919

CURRENTS AROUND THE HAWAIIAN ISLANDS. A STUDY OF COASTAL CURRENTS IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
D. E. Avery, D. C. Cox, and T. Laevastu.
Report No 26, Interim Progress Report 1, January 1963. 22 p, 13 fig, 3 tab.

Descriptors: *Hawaii, *Currents(Water), Coasts, *Islands, Tides, Circulation, Reefs, Channels, Topography, *Waste disposal, *Path of pollutants, Data collections, Sewage disposal.
Identifiers: *Tidal currents, Littoral currents, Windward, Leeward.

As part of a larger study on the dispersal and transport of waste in coastal areas, this interim report deals mainly with currents. Data gathered during the summer and fall of 1962 are presented in the appendix. Subjects are: nature of tides around the Hawaiian Islands; behavior of tidal currents and their relation to tidal amplitudes; separation of coastal and offshore circulations; influence of depth of water and coastal topography on the coastal currents; currents inside reefs and in channels; surface currents on windward and leeward sides of the islands; change of currents with depth; and currents around sewer outfalls. (Sinha-OEIS)
W74-04925

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04929

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
W. F. Bohlen.
In: IEEE Conference on Engineering in the Ocean Environment, San Diego, California, September 21-24, 1971. (IEEE Publication 71 C40-OCC) p 238-242, 1971. 18 ref.

Descriptors: *Estuaries, *Diffusion, Turbulence, *Environmental effects, Instrumentation, Models, *Path of pollutants, Tides, *Density stratification.
Identifiers: Bottom roughness.

Evaluation of the diffusion characteristics of an estuary requires an understanding of the turbulence structure and a measure of the range and variability of the eddy diffusion coefficients. Such data are of primary importance to investigators seeking to estimate possible environmental changes through predictive numerical or hydraulic models. A review is presented of the turbulence problem with particular emphasis on estuaries. Both spectral characteristics and spatial scales are considered and related to experimental procedures. Currently available instrumentation is reviewed and its performance criticized. Emphasis is placed on long-term reliability. Both Lagrangianhe summer, deposition is slight becuase of low runoff, southward littoral drift, and northwest winds. The well-mixed estuarine system also precludes the net transport of sediments into the tidal entrance and up the estuarine channel. (Sinha-OEIS)
W74-04933

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04954

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
R. S. Murphy.
Available from the National Technical Information Service as PB-228 851, $9.00 in paper copy, $1.45 in microfiche. Report No. IWR-38, 1973. 108 p, 1 fig, 22 tab, 52 ref, 2 append. OWRR B-009-ALAS(1).

Descriptors: *Camping, *Recreational facilities, *Recreational wastes, *Water supply systems, Water quality, Water sources, Waste disposal, Water pollution sources, *Alaska, Potable water.
Identifiers: *Campgrounds.

An evaluation is presented of water quality in Alaskan Campgrounds using laboratory determinations and on-site evaluations. In general, ground water quality was excellent and surface water quality unacceptable for human consumption and total body contact recreation. The most pressing need was the provision of an approved drinking water supply for each campground. The environmental health aspects of campgrounds were found to be largely neglected. Many of the sewage systems are inadequate, resulting in pollution of the ground and surface water. Solid waste was stored and disposed of by unacceptable methods. Finally, many campgrounds are located in swampy areas or in areas subject to annual flooding. (Hartman-Alaska)
W74-04974

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muller, J. F. Battaile, L. A. Bond, and P. W. Lamson.
Available from the National Technical Information Service as PB-228 871, $12.50 in paper copy,

$1.45 in microfiche. Report No. 15, Natural Resource Systems Series, February 1973. 126 p, 26 fig, 17 tab, 22 map plates, 81 ref. OWRR A-999-ARIZ(3).

Descriptors: *Water quality, *Salinity, *Salt tolerance, *Saline water, Artesian aquifers, Agriculture, Groundwater recharge, Social impact, Economic impact, Hydrologic systems, Conductivity, *Arizona, Irrigation water, Crop response, Model studies, Water pollution sources.
Identifiers: *Safford Valley(Ariz).

Changes in groundwater quality averaging 0.13 millimhos electrical conductivity and 35 ppm chloride increase are documented between 1940 and 1972. The decrement in the water quality of the surficial aquifer is attributed to the interaction of four major mechanisms. Brine leakage from underlying artesian aquifers, natural recharge of the surficial aquifer by saline waters, recharge of the aquifer by concentrated agricultural waters, and lateral groundwater movement through saline lacustrine beds appear to be the major salt sources. A chemical thermodynamic computer model of recharge water quality, and the construction of iso-chemical maps from analyzed water samples show artesian aquifer leakage to be the significant contribution of salts to the system. An economic analysis of the Safford Valley, based on the modeling of a 'representative farm' analog, indicates that cotton will remain economical to produce on the basis of the projected salinity trends, for a significant time beyond the limits of prediction of the models employed. A sociologic analysis of the area, based on an extensive questionnaire survey, shows that although the local farmers are aware of the salinity problems in the area they are not greatly concerned by them. (Muller-Arizona)
W74-04976

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
Y. C. Rogers.
Available from the National Technical Information Service as PB-228 874, $6.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 59 p, 7 tab, 3 fig, 38 ref. OWRR A-039-NMEX(3).

Descriptors: *New Mexico, *Ecology, Forestry, Lichens, Bacteria, Microorganisms, Biology, Fungi.
Identifiers: *Usnea tillandsioides, *Usnic Acid, Aboreal lichen.

The objectives were to obtain a measure of the amount of Usnea that falls to the forest floor; to determine if there is any difference between usnic acid production in the summer and the fall; to determine if rainwater is an important factor in leaching usnic acid out of lichen material; and to examine the effects of usnic acid upon soil microorganisms and germinating coniferous seedlings. Usnea tillandsioides, an aboreal lichen, was observed in great numbers on spruce and fir at an elevation of 11,200 feet in the Sangre de Cristo Range, New Mexico. The amount of fallen lichen material per hectare was estimated. Extractions from lichen thallus demonstrated that the quantity of usnic acid was less in summer lichens than in fall lichens. An examination of extracted rainwater did not indicate that usnic acid was being leached from lichens by rainfall. The small amount of usnic acid present in soil and litter samples suggested that decomposition of usnic acid must be taking place. Soil fungi and bacteria cultured in a liquid medium containing usnic acid allowed measurements and extrapolation of these organisms' ability to degrade usnic acid. Coniferous seeds were also subjected to usnic acid and compared for their ability to germinate and form roots under various concentrations. Further experimentation with young trees indicated that usnic acid may be extremely damaging when applied to roots in a concentration of 0.2 mg/ml ethyl acetate. (Creel-New Mexico)
W74-04979

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-04983

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
A. A. Ali-Zade, E. A. Daidbekova, P. A. Shoykhet, and G.-M. A. Aliyev.
Litologiya i Poleznyye Iskopayemyye, No 2, p 30-40, March-April 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Organic matter, *Organic compounds, *Sediments, *Carbonate rocks, *Mesozoic era, Recent epoch, Sedimentary basins(Geologic), Facies(Sedimentary), Oil, Petrology, Geochemistry, Water pollution sources.
Identifiers: *Caspian Sea, *USSR(Caucasus Mountains), Bitumens.

Distribution of organic matter was investigated in Recent sediments of the Caspian Sea and in Mesozoic rocks of the southeastern Caucasus. Carbonate sediments of enclosed sedimentation basins of the Caspian Sea type exhibit secondary formation of bitumens and hydrocarbons. This process involves both the shallow-water and deep-water facies of the region of present-day carbonate sedimentation. A study was made to trace the lithological-geochemical conditions promoting oil formation in Mesozoic rocks of the southeastern Caucasus. (Josefson-USGS)
W74-05021

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
I. Yu. Lubchenko, and I. V. Belova.
Litologiya i Poleznyye Iskopayemyye, No 2, p 23-29, March-April 1973. 4 tab, 11 ref.

Descriptors: *Geochemistry, *Trace elements, Movement, Rivers, *Dissolved solids, *Suspended solids, Suspension, Turbidity, Colloids, Oxides, Sorption, Filtration, Particle size, *Path of pollutants, Pollutant identification.
Identifiers: *USSR(Black Sea basin).

A study was made of migration of Ti, Fe, Mn, P, Zr, W, Cr, Ni, V, Co, Cu, Pb, Mo, Ga, and Zn in rivers of the Black Sea basin in 1968. Suspended and dissolved solids were separated by filtration through F-5 bacterial filters. The filtrate obtained showed no signs of opalescence, indicating complete separation of the suspended materials, including colloids. Analysis of grain-size distribution of river-water suspensions showed no direct relationship between the content of a given fraction and the general turbidity of water. Topography of the catchment area had little effect on grain-size distribution of the suspensions. Ti, Zr, Cr, and V showed a distinct tendency to accumulate in coarser fractions and Mn, Fe, Ni, Cu, Mo, W, Pb, and Zn in finer fractions. The concentration of elements in solution depends on the general turbidity of water. The migration of elements in solution is affected by sorption processes. The importance of sorption is demonstrated by the removal of amorphous iron and manganese oxides from the samples. Modes of migration of the elements are determined not only by whether the particular element migrates in solution or in suspension but also by the element's sorption activity. (Josefson-USGS)
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov.
Litologiya i Poleznyye Iskopayemyye, No 2, p 3-22, March-April 1973. 6 fig, 4 tab, 52 ref.

Descriptors: *Geochemistry, *Trace elements, *Distribution patterns, *Sedimentology, *Bottom sediments, Bottom sampling, Inorganic compounds, Metals, Organic compounds, Organic matter, Recent epoch, Correlation analysis, Water pollution sources.
Identifiers: *USSR(Black Sea), Mediterranean Sea, Organic carbon, Oozes, Sapropel.

A study was made of the vertical distribution of Fe, Mn, Ti, P, Cu, Ni, Co, V, Cr, Mo, W, Zr, Se, Ge, U, $CaCO_3$, and organic C in deep-sea sediments of the Black Sea. The distribution of chemical elements observed in Black Sea sediments is the result of a complex and many-sided geochemical evolution of the basin from Neoeuxinian to Recent time. Unlike the Neoeuxinian deposits, the change in concentrations of elements in Old Black Sea and Recent sediments, reflected in their enrichment in $CaCO_3$, organic matter, and the group of geochemically mobile elements and in their impoverishment in Mn and relatively immobile elements, is due to a number of factors. The most important factor is the weakening of the hydrodynamic regime, which, as a result of intensified differentiation and diminution of the sedimentation rate in deep-sea sediments, has led to a change in the concentration of all elements in the observed direction. Additional factors include increased contents of organic matter in the sediments, occurrence of hydrogen-sulfide contamination in water of the Black Sea, and inflow of Mediterranean waters through the Bosporus. (Josefson-USGS)
W74-05023

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
R. B. Johnson, Jr.
Available from NTIS as COM-72-11170, price $3.00 in paper copy, microfiche $1.45. Completion Report for Period April 1966 - March 1970, July 1970. 136 p, fig, ref. NOAA 2-12-R.

Descriptors: Texas, *Animal habitats, Fisheries, Ecology, *Coastal engineering, *Powerplants, *Harbors, Levees, *Hurricanes, *Electric power, *Water pollution sources.
Identifiers: Gulf Coast, Ecosystems.

The following were studied: the effects of habitat modification on the fishery ecology of Cedar

Bayou, Texas; the effects of engineering projects on the ecology of Jones Bay, Texas; the effects of engineering projects on the ecology of Moses Lake, Texas; and the effects of habitat modification on the fishery ecology of Trinity Bay, Texas. Studies were set up to determine the extent and quality of nursery environment for commercial and recreational fishery species, and to examine related environmental features, before, during and following construction or habitat modification where possible. Various gear were used to sample the biota. Major types used were bag seines (minnow seines), bar seines, drag seines, otter trawls, marsh nets and plankton two nets. Other samples were taken with Ekman dredge, core tubes, and by hand. Hydrographic studies included sampling for salinity, temperature, turbidity and dissolved oxygen. (Sinha - OEIS)
W74-05038

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
S. G. Heidel.
Journal American Water Works Association, Vol 57, No 2, p 239-244, February, 1965. 1 fig, 2 tab, 3 ref.

Descriptors: Wells, *Water wells, Water resources, *Water supply, *Groundwater, Aquifer characteristics, *Iron bacteria, Pollutants, Corrosion, *Oxidation-reduction, *Dissolved oxygen, Hydrogen ion concentration, Pollutant identification.
Identifiers: *Salisbury(Md.), 'Red water', Well efficiency, Production decline.

In September 1962, U.S. Geological Survey was asked to appraise the water resources of the Salisbury, Md., area. The first phase of the study was concerned with an apparent iron problem in the city well field. The municipal supply is obtained from sixteen shallow wells drilled adjacent to Beaverdam Creek. The principal recharge of the producing aquifer, or water-bearing zone, is from surface water sources, including Beaverdam Creek and ponds in the creek created by low dams, and from precipitation that infiltrates the porous soil of the area. Many communities using ground water as their source of supply have reported problems that are similar in some respects to those in the Salisbury wells. Basically, the reported symptoms are that yields of the municipal wells have been decreasing; a thick coating of material resembling iron oxide has been observed on the interior of the pump discharge lines of some wells; periodic analyses of water samples from the wells have revealed increases in total solids; and there have been complaints from some water users that 'dirty' or 'rusty' water is coming from their taps. Several hypotheses for the problems were derived. The methods of investigation, results and conclusions are presented. (Hunt-NWWA)
W74-05078

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
A. A. Hirsch.
Journal American Waterworks Association, Vol 56, No 11, p 1474-1480, November, 1964. 6 fig, 3 tab, 3 ref.

Descriptors: Wells, Oil wells, *Water quality, *Water supply, Pollution, *Oil wastes, Saline water, *Flow augmentation, Hardness, Public health, Legislation, *Louisiana, Municipal water.
Identifiers: *Shreveport(La.), Cross Lake(La.), Brine production, Oil field pollution.

Shreveport has drawn its municipal water supply from nearby Cross Lake since January 1926. Its watershed covers 264 sq mi, 63 per cent lying in the western part of Caddo Parish, La., and 37 percent in the eastern part of Harrison County, Texas. In this drainage area are located two important oil fields that extend across the Texas-Louisiana border. As oil production grew in the Cross Lake runoff areas, the quality of the streamflow, as reflected in the salt concentration of the lake water, suffered. Clearly evident from official records is the increasing salt concentration, with recent levels above 150 ppm NaCl far exceeding earlier levels of 15-30 ppm. Waste petroleum brines are characteristically high in salt, with only insignificant amounts of other compounds commonly found in natural waters. The increasing values of the salt to alkalinity ratio establish oil well wastes as the pollutant. Shreveport's various sources of water supply are all intimately connected with the extent of oil well brine releases within their respective watersheds. Unless considerable reduction in the salinity of raw-water supplies is soon apparent, efforts will be required to enact sweeping mandatory regulations for injection. This practice has been adopted under state or federal insistence in other areas, some of them of far less importance than is a metropolitan water supply. (Hunt-NWWA)
W74-05079

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
For primary bibliographic entry see Field 4B.
W74-05084

REPORT OF THE POLLUTION COMMISSION, PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
H. Jagger, and L. H. Brown.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p Z25-Z31, (1969). 4 ref.

Descriptors: *Water pollutant sources, Water pollution, *Water pollution control, Oil, *Oil spills, Oily water, Public health, Pipelines, *Oil industry.
Identifiers: *Great Britain.

Although public health and river pollution considerations have given rise to legislation relating to the discharge of harmful and obnoxious effluents over the past century, pollution of fresh water resources by oil is a relatively recent concern. The pipelines, from the mid-1950's, resulted in increased concern by water supply authorities that water pollution of considerable magnitude might result from the failure of one such line. This conference underscores the joint activities of the water and oil industries that have been useful in providing a better mutual understanding of the problems involved and in suggesting steps which are reducing the risks and consequences of pollution of water resources by oil. (Staplin-NWWA)
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
T. E. Larson.
Journal American Water Works Association, Vol 56, No 2, p 169-172, February 1964.

Descriptors: Wells, *Water wells, *Water supply, Water quality, Aquifer characteristics, *Groundwater pollution, Odor, Taste, *Water quality control, *Illinois, *Iron, Hydrogen sulfide, Chlorides.
Identifiers: *Galvanic corrosion, Galesville sandstone, Galena-Platteville formation.

Most problems in well water quality are inherent and not receptive to correction by any means other than external treatment. These problems are usually related to the natural hardness or iron content of the water from the aquifer or from one of the contributing aquifers. Perhaps the most annoying problems are due to the iron content of the water. At times the occurrence of such problems is inexcusable or may be condoned only because of lack of information or adequate interpretation of information. Another less frequently encountered but more objectionable problem is that of hydrogen sulfide in well waters. This 'rotten-egg' odor almost always demands treatment. Case studies of these problems, their causes and corrective measures taken in 3 aquifers are presented. It is concluded that in many cases the pollutants enter the well from outside the producing zone due to improper or nonexistent sealing; however, it should be remembered that preventive measures taken during construction are usually superior to and less costly than corrective measures. (Hunt-NWWA)
W74-05100

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
M. A. Shirazi, and L. R. Davis.
Copy available GPO Sup Doc as EP1.23/2:72-0053, $1.75; microfiche from NTIS as PB-228 293, $1. 5. Environmental Protection Agency, Technology Series Report EPA-R2-72-005a, August 1972. 228p, 8 fig, 12 tab, 7 ref. EPA Project 16130.

Descriptors: *Jets, *Thermal pollution, Publications, *Discharge(Water), *Distribution patterns, Water pollution effects, Heated water, Forecasting, Water pollution sources.
Identifiers: Submerged jets, *Nomograms, *Thermal plumes, *Submerged discharge.

This workbook contains computational procedures in the form of nomograms designed to satisfy several needs related to the discharge of thermal waste into large bodies of water. They provide estimates of physical spread and temperature distribution around the discharge point for the assessment of biological and physical effects of heated water. They can be used as guidelines for setting temperature standards and for monitoring. Finally, they have utility in pre-design feasibility analyses and outfall performance estimates. Data and analyses from numerous sources constitute the backup material for this publication. An attempt has been made to unify and present the material in a format that is sufficiently simple for a non-specialist user. A number of illustrative examples are presented which demonstrate the use of each set of nomograms in practical problems. The status of analysis at this time is not sufficiently advanced to encompass a wide range of experimentally verified predictive models. For this reason, care must be exercised when applying the generalized nomograms to specific situations. The major restrictions for each set of nomograms are outlined in the text which the user is advised to review carefully. In general, the nomograms provide meaningful qualitative information for a wide range of problems of practical interest, but their use is subject to scrutiny and proper interpretation when applied to exacting design conditions. (EPA)
W74-05111

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
H. F. Grubb, and P. D. Ryder.
In: Proceedings of 3rd Annual Environmental Engineering and Science Conference, March 5-6, 1973, Louisville, Ky: University of Louisville Speed Scientific School, p 127-137, 1973. 7 fig, 2 tab, 2 ref.

Descriptors: *Regression analysis, *Monitoring, *Sulfates, *Acid mine water, *Coal mines, Mine acids, Data processing, Statistical methods, *Kentucky.
Identifiers: *Tradewater River basin(Ky).

The Tradewater River basin above the U.S. Geological Survey stream-gaging station at Olney, Ky., has been extensively mined for coal by both underground and strip-mining methods. A relationship between specific electrical conductance (X) and sulfate concentration (Y) can be represented by a simple linear regression equation of the form $Y = a + bX$. The regression coefficients a and b were determined using data from 465 chemical analyses made over a 17-year period at the Olney Station. Reduction of the standard error of about 40% was achieved by removing 16 data points representing water anomalously high in bicarbonate and associated with rainfall and runoff from the western, nonmined portion of the basin. Sulfate concentration, estimated from specific conductance measurements and the relationships $\log Y = -1.015 + 1.242 \log X$, was compared to the sulfate concentration in 96 water samples collected from the Tradewater River at Olney since 1966. The maximum error of prediction was 26%, and 89% of the estimated values were within 10% of the observed sulfate concentrations. The long-term effects of coal mining on stream water chemistry can be monitored with specific conductance and only a limited number of chemical analyses to verify the stability of the sulfate-conductance relationship. (Knapp-USGS)
W74-05125

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MICROBIAL DEGRADATION OF PETROLEUM IN CONTINENTAL SHELF SEDIMENTS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
P. G. Hunt, F. R. Koutz, R. P. Murrmann, and T. G. Martin.
Special Report 196, December 1973. 16 p, 5 fig, 2 tab, 38 ref, append.

Descriptors: *Oil spills, *Contential shelf, *Biodegradation, *Path of pollutants, Bottom sediments, Oil pollution, Aerobic conditions.

A study was conducted to determine whether petroleum waste products deposited in surficial sediments of the United States Continental Shelf would be subject to microbial degradation. Degradation of these waste products should occur under the aerobic conditions commonly present in the sediments, but under anaerobic conditions, degradation of hydrocarbons should be extremely slow. It was verified, using carbon-14 labeled hydrocarbons, that degradation of petroleum in sediments occurs when oxygen is very limited; however, several hundred years would be required for complete degradation to occur. (Knapp-USGS)
W74-05153

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
Available from NTIS, Springfield, Va., as Rept. No. DPST-73-436, $4.00 per copy, $1.45 microfiche. Report No. DPST-73-436, Sept. 1973. 23 p.

Descriptors: *Environment, *Monitoring, *Radioactivity, Rivers, *Nuclear powerplants, Nuclear wastes, Effluents, Streams, Administration, Standards, Regulation, Water pollution safety, Public health, Ecology, Forests, Limnology, Meteorology, Fuel, Fabrication, Radioactive waste disposal, Food chains, Transport depletion, *South Carolina.
Identifiers: *Savannah River(So Car).

The Savannah River Plant consists of three operating nuclear production reactors, two separations areas for processing irradiated materials, a heavy water extraction and recovery plant, reactor fuel fabrication facilities, the Savannah River Laboratory (a process development laboratory to support production operations), and the many non-nuclear facilities necessary for plant operations. The purpose and operation of the plant activities and the funded programs to modify the impact of potential or actual releases to the environs are described. Inasmuch as the plant processes are quite complex, this report does not describe any of the activities in depth nor does it delineate in detail the results of the various emission controls, environmental research, and environmental monitoring programs. Rather, the report gives general descriptions of these activities. For fiscal year 1974, the operating budget for the plantsite is about $125 million; about 10% of this amount is spent for environmentally oriented activities. (Houser-ORNL)
W74-05173

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05175

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
D. H. Denham, D. A. Baker, J. K. Soldat, and J. P. Corley.
Available from NTIS, Springfield, Va., as Report No. BNWL-1764. $5.45 per copy, $1.45 microfiche. Report No. BNWL-1764, Sept. 1973. 71 p, 7 fig, 22 tab, 28 ref, 6 append.

Descriptors: *Radioactive waste disposal, *Nuclear powerplants, Effluents, *Air pollution, *Water pollution, Soil contamination, Management, Regulation, Social aspects, Public health, Benefits, Cost-benefit analysis, Cost-benefit theory, Radioisotopes, Strontium, Cesium, Model studies, Mathematical models, *Computer models.

The overall risk evaluation for various radioactive waste management concepts includes calculations of radiation doses to individuals and local populations. Radiation doses are the most appropriate measure of the consequences of unforeseen releases of radioactive materials to the environment and dose criteria are available by which the severity may be judged. A comprehensive dose computational model, developed and used for other Atomic Energy Commission studies, has been adopted to improve its flexibility and to assist in evaluating alternative means for disposal of high-level waste. Typical input terms for normal use include source terms (radionuclide release rates to man's immediate environment) and dilution factors. Outputs include individual pathway doses and total doses to maximum individuals for both an urban and a rural population. Whole body doses plus doses to other critical organs are obtained, as well as the fractional dose contributions of individual nuclides. Doses for one year or total doses for fifty years of exposure are available. (Houser-ORNL)
W74-05176

ENVIRONMENTAL MONITORING. ANNUAL REPORT, 1972, (ATOMICS INTERNATIONAL),
Atomics International, Canoga Park, Calif. Health, Safety and Radiation Services Dept.
J. D. Moore.
Available from NTIS, Springfield, Va., as Rept. TID-26442, $4.00 per copy, $1.45 microfiche. Report TID-26442, 1972. 27 p, 7 fig, 8 tab, 3 ref, 3 append.

Descriptors: *Monitoring, *Environment, *Background radiation, *Radiation, *Nuclear explosions, Safety, Toxicity, Public health, Soils, Vegetation, Water, Air, Survey, Measurement.
Identifiers: *Weapons testing.

Environmental monitoring at Atomics International is performed by the Operational Safety and Waste Management Unit of the Health, Safety and Radiation Services Department. Soil, vegetation, water, and air are routinely sampled up to a distance of 10 miles from Atomics International sites. Site perimeters are monitored for radiation levels by means of thermoluminescent dosimeters. The environmental radioactivity reported herein is attributed to natural causes and to nuclear weapons testing, rather than to Atomics International operations. The environmental monitoring program provides a measure of the effectiveness of the Company's radiological safety procedures and of engineering safeguards incorporated into facility designs. (Houser-ORNL)
W74-05177

LOW-LEVEL RADIOACTIVITY MEASUREMENTS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-05178

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
Available from NTIS, Sprinfield, Va., as Rept. No. EGG-1183-1591, $4 per copy, $1.45 microfiche. Report No. EGG-1183-1591, May 1, 1973. 21 p, 3 fig, 3 tab, 3 ref.

Descriptors: Survey, *Radioactivity, *Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Nuclear powerplants, Effluents, Public health, *Remote sensing, *Minnesota.
Identifiers: *Elk River(Minn).

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Elk River experimental power reactor during August and September 1968. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 900 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W74-05179

GENERAL ENVIRONMENTAL SITING GUIDES FOR NUCLEAR POWER PLANTS -- TOPICS AND BASES, (DRAFT).
Directorate of Regulatory Standards (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05180

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va., as CONF-710501, Proceedings, Vol. 1, $13.60 per copy, $1.45 microfiche. Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, D. J. Nelson, Editor. Report CONF-710501-P1, (1971), 678p.

Descriptors: *Ecosystems, *Radioecology, *Radioisotopes, Ecology, Radioactivity, *Path of pollutants, *Environmental effects, Assay, Measurement, Water pollution, *Monitoring.

Contents of volume I are divided into eight parts: Plenary Session Papers; Radionuclides in Terrestrial Ecosystems; Radionuclides in Freshwater Ecosystems; Thermal Effects Studies; Radionuclides in Marine Ecosystems; Models of Radionuclides in Ecosystems; Effects of Ionizing Radiation on Plants and Plant Communities; and Effects of Ionizing Radiation on Species and Populations. (See also W74-05182 thru W74-05212)
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
R. B. Platt, H. L. Ragsdale, and D. J. Shure.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, (1971) p 9-17, 5 fig.

Descriptors: *Radioactivity, *Environment, *Ecology, *Evaluation, Assay, *Measurement, Appraisals, Assessment, *Ecosystems, Quality control, Forecasting, Balance of nature, Eurthrophication, Food chains, Biota, Biorhythms, Computer programs, Data storage and retrieval, Meteorology, Hydrology.

Both a philosophy and a plan of action are are presented for an ecosystem approach to the measurement and evaluation of radioactive nuclides in the environment. Methods currently in use are generally restricted to an analysis of those environmental components directly related to man. Yet man's welfare depends also on the long-range quality of his total environment. For example, it is becoming apparent that negative feedbacks to man originate in natural systems. Thus, the prediction and discovery of trends of environmental change must be based on the entire network of trophic and subsystem transfers. Irreversible environmental problems usually arise through couples among biotic subsystems. Reversals of potential threats to man are least expensively made by understanding and regulating inputs to natural systems. Changes become irreversible or expensively reversible when detected in food chains coupled directly to man. Food chains are treated functionally as natural, recreational, and domestic, with each of these assigned to the primary environmental components, including man. Computer programming provides for data storage, systems analysis of the data with respect to base lines and trends, and both tabular and graphic data displays. (See also W74-05181) (Houser-ORNL)
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
B. Kahn.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 30-36, (1971), 1 fig, 4 tab, 10 ref.

Descriptors: *Radioactivity, *Environment, *Nuclear powerplants, Effluents, Ecology, *Radioecology, Monitoring, Ecosystems, Aquatic life, Air pollution, Water pollution, Public health, *Path of pollutants, Survey, Assay, Measurement, Food chains.
Identifiers: *Surveillance program.

The radionuclides that can be found in the environment of commercial nuclear power stations are indicated, problems of environmental surveillance are discussed, and topics of radioecological research in this area are suggested. The information on radionuclides in the environment is derived from radionuclide release data and routine environmental monitoring by the stations and from field studies at several stations. The results show that several radionuclides are readily detectable in the aquatic ecosystem at many or all stations. Measurement of radioactive gases in ground-level air at several stations can be used to determine dispersion of stack effluents in air. Little or no radioactivity from the stations has been found in the terrestrial ecosystem. (See also W74-05181) (Houser-ORNL)
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, J. J. Koranda, and W. L. Robison.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 37-52, (1971) 5 fig, 10 tab, 58 ref.

Descriptors: *Environment, *Natural gas, *Secondary recovery(Oil), Benefits, Cost-benefit ratio, *Air pollution, Water pollution, Food chains, Public health, Food, Milk, Vegetation, Path of pollutants, Tritium, Krypton radioisotopes, *Radioecology, *Nuclear explosions, Computer models.
Identifiers: Project Rulison.

It is likely that future activities administered by the USAEC Division of Peaceful Nuclear Explosives will be in the area of underground engineering, and particularly in the stimulation of deeply buried natural gas reservoirs of low permeability. The successful development of this technology could double the proved recoverable resources of natural gas in the United States. During the developmental stage of the technology, large quantities of THO are released to the environment as the gas is withdrawn. Efforts to predict potential doses resulting from such releases have been severely handicapped by the lack of adequate data to predict the ecological movement of THO. A radio-ecological study was conducted in conjunction with Project Rulison, the second nuclear-stimulation experiment, to evaluate these parameters; controlled laboratory studies were also initiated. The results indicate that the environmental residence time of THO is at least an order of magnitude shorter than has been frequently assumed, and that this invalidates the commonly used deposition velocity approach for the calculation of doses due to food chain contamination by THO vapor. A simple but realistic model is developed based on these findings to predict the dose to man via the forage-cow-milk, forage-cattle-beef, vegetation, and inhalation pathways. The dose predicted by this model for the Rulison area residents is 10 to the third power to 10 to the fourth power lower than the preflaring estimates made by a variety of organizations. (See also W74-05181) (Houser-ORNL)
W74-05184

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
S. Strauch.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 53-62, (1971) 15 fig.

Descriptors: *Nuclear powerplants, *Radioactivity, Effluents, *Environment, Assessment, *Forecasting, River basins, Mississippi River, Missouri River, Ohio River, Lake Michigan, *Path of pollutants, Food, Water, Food chains, Population, Public health, Computer programs, Model studies, *Computer models.

A study was initiated by AEC in January 1970 to develop a computer model and necessary data to permit estimates of potential doses and dose commitments to individuals and population groups as a result of selected release rates from reactors and fuel reprocessing plants in a large geographic region. The model is of the sophistication warranted for 30 years forecasting purposes and of sufficient generality and scope to permit it to eventually encompass the contiguous United States. The study is being conducted by the Hanford Engineering Development Laboratory at Richland, Washington, with the assistance of Battelle Memorial Institute under the direction of the AEC Division of Reactor Development and Technology and the Director of Regulation. The model is being applied initially to the Upper Mississippi River Basin for the nuclear facilities which are projected to be located in that region by the year 2000. Exceptional care is being taken to ensure that all radionuclides and their associated pathways that lead to significant doses are included in this initial development phase of the model. (See also W74-05181) (Houser-ORNL)
W74-05185

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

GAMMA-EMITTING RADIONUCLIDES IN ALASKAN ENVIRONMENTS 1967-1970,
California Univ., Livermore. Lawrence Livermore Lab.
J. J. Koranda, and J. R. Martin.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 81-107, (1971) 5 fig, 19 tab, 23 ref.

Descriptors: *Environment, *Sampling, *Radioactivity, *Assay, *Measurement, Evaluation, Safety, Air pollution, Water pollution, Soil contamination, Vegetation, Lichen, Fallout, Cesium, Nuclear explosions, Radioisotopes, *Alaska.
Identifiers: China, *Amchitka Island(Alas).

Environmental samples were collected at several sites in Alaska to determine the present status of radionculides in Alaskan environments, with special emphasis on Amchitka Island. Samples were obtained on Amchitka Island, the coastal Alaska near Anchorage, and in central Alaska in the Fairbanks area. Lichens, grasses, herbs, and shrubs were collected along the Amchitka Island to Fairbanks transect of Alaskan environments. Radionuclide concentrations were determined by scintillation crystal and solid-state gamma spectroscopy. Cesium-137 was the most abundant radionuclide found in the northern environments, with low but detectable concentrations of Eu-155, Sb-125, Ce-144, and Mn-54 also being present. Fallout from recent Chinese tests produced increased levels of Zr-95/Nb-95 in the 1970 samples. Lichens have the highest concentrations of Cs-137, but evergreen vascular plants also had Cs-137 concentrations in the same range as those found in lichens. Plants with an annual topgrowth, such as grasses, had low to nondetectable concentrations of radionuclides. These data describe radiometric base lines pertinent to current testing programs being conducted in the Aleutian Islands and relate those base lines to those occurring elsewhere in the high latitudes. (See also W74-05181) (Houser-ORNL)
W74-05187

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
J. R. Martin, and J. J. Koranda.
In: CONF-710501-P1, Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 108-115, (1971) 5 fig, 1 tab, 25 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Vegetation, *Lichens, Ecology, Ecosystems, Water pollution, Fallout, Sampling, Assay, Data collections, Radioecology, Absorption, Cycles, Food chains, Public health, Radioisotopes, *Alaska, *Path of pollutants.
Identifiers: Residence half-time, Aleutian Islands(Alas), Anchorage(Alas).

Radionuclide concentrations in Alaskan plant species were measured in the period 1967-1970 when incoming fallout was a small fraction of the accumulated inventory present in the vegetation. Samples were collected in five geographic areas from the western Aleutians to the interior of Alaska. Radionuclide concentrations in 150-g aliquots of dried, ground, and compressed samples were measured by scintillation gamma spectrometry. The residence half-time for Cs-137 in Cladonia sp. lichens was approximately three years on Amchitka Island and the coastal area near Anchorage, Alaska. In central Alaska near Fairbanks and in the mountains near Anchorage, the residence half-time for Cs-137 in lichens was about eight years. Evergreen vascular plants from these higher elevation sites had residence half-times of only one to three years. (See also W74-05181) (Houser-ORNL)
W74-05188

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
J. H. Jenkins, and T. T. Fendley.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 116-122, (1971) 5 fig, 4 tab, 14 ref.

Descriptors: *Monitoring, Measurement, *Radioisotopes, *Cesium, *Strontium, *Deer, Southeast region, Fallout, Water pollution, Absorption, Food chains, Public health, Radioecology, Vegetation, Bioindicators, Biology, Bioassay, Atlantic Coastal Plain, Gulf Coastal Plain.
Identifiers: *Bioaccumulation.

Muscle samples have been obtained from over 1000 deer throughout the Southeast during the past five years and analyzed for radionuclides. Deer from the Lower Coastal Plain region had consistently higher levels of Cs-137 than deer from the Upper Coastal Plain, Piedmont, Central Plateau, and Mountain regions. In the Lower Coastal Plain, deer muscle average 45,000 pCi/kg of Cs-137, with some specimens ranging up to over 150,000 pCi/kg. Animals from the other provinces averaged around 4000 pCi/kg. Evidence that Sr-90 is effectively transported through the Lower Coastal Plain environment also. Strontium values in deer were comparable to the values found in Arctic herbivores, while the Cs-137 values are higher than were found in the Arctic. Potassium deficiency in vegetation probably increases radionuclide bioaccumulation. Cropland vegetation is 20X higher in potassium and has only 1 to 3% as much radioactive cesium as forest and swampland vegetation. Bioaccumulation in wildlife may well become a classic example of radionuclide cycling. Data indicate that the sterile, sandy soils of the Lower Coastal Plain in combination with high water tables and some specific radionuclide-concentrating plants produce the conditions which result in biomagnification of Cs-137 and Sr-90 in deer. (See also W74-05181) (Houser-ORNL)
W74-05189

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
S. L. Cummings, J. H. Jenkins, T. T. Fendley, L. Bankert, and P. H. Bedrosian.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 123-128, (1971) 1 fig, 4 tab, 15 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Deer, *Southeast U.S., Vegetation, Soils, Radioecology, Sands, Assay, Soil analysis, Leaching, Ion transport, Soil water, Absorption, Atlantic Coastal Plain, Gulf Coastal Plain.

Data are presented for Cs-137 in white-tailed deer and vegetation of the southeastern United States along with information as to the nature of the associated soils. The concentrations of Cs-137 in some of the vegetation were of sufficient magnitude to account for the Cs-137 concentrations found in the deer. The highest Cs-137 concentrations in deer were associated with the humic-gley soils along the Atlantic and Gulf Coasts. These soils are predominately sandy in nature and have relatively low fixing capacities. The concentrations of Cs-137 in the vegetation grown on the humic-gley soils under natural and controlled conditions were greater than from the gray-brown podzolic and red-yellow podzolic soils. (See also W74-05181) (Houser-ORNL)
W74-05190

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. R. McHenry, A. C. Gill, and P. H. Hawks.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 129-132, (1971) 2 fig, 4 tab, 11 ref.

Descriptors: *Fallout, *Cesium, *Monitoring, Measurement, *Watersheds(Basins), *Mississippi, Distribution, Sediment distribution, Ecological distribution, Model studies, Hydrologic data, Hydrologic models, Movement, Diffusion, Dispersion, Transfer, Sediment transport, Entrainment, Path of pollution, Erosion.

Concentration of fallout Cs-137 in soils and sediments of a small watershed in north Mississippi was measured to determine the redistribution of fallout Cs-137. Measured concentration of Cs-137 ranged from 8.9 nCi/sq m in soils from actively eroding areas to 412.2 nCi/sq m in conservation pool sediments. A model was constructed for the distribution of Cs-137 in the watershed. Sixty-one percent of the Cs-137 in the conservation pool sediments was derived from the movement of Cs-137 from the contributing watershed. Of the Cs-137 moved from the watershed, 53% was contributed from the eroded areas which presently occupy 4% of the contributing watershed area. The efficiency of the reservoir for trapping or retaining Cs-137 carried into it from runoff was 57%. Of the total Cs-137 deposited in the watershed, less than 7% moved from the contributing watershed and only 3% of the Cs-137 deposited in the watershed moved through the reservoir outlets. (See also W74-05181) (Houser-ORNL)
W74-05191

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

CESIUM-137 SOIL INVENTORY OF A TAGGED LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
C. W. Francis, and T. Tamura.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 140-149, (1971), 5 fig, 9 tab, 14 ref.

Descriptors: *Cesium, *Absorption, *Soils, *Radioactive tracers, *Tracking techniques, *Path of pollutants, Absorption, Cycles, Forest, Forest soils, Root systems, Soil-water-plant relationships, Minerals, Sorption, Radioecology, Ecosystems, Ion exchange, Clays, Research and development.

The soil has become a major sink for Cs-137 innoculated into Liriodendron in 1962. The distribution of this radionuclide within the soil profile and among soil fractions was determined in soil samplings of late fall 1962 and summer 1969. The much higher concentractions of Cs-137 in the clay fraction (1962 samplings) at a soil depth of 6 cm (11.1 pCi/mg) as compared with that at 4 and 9 cm (4.8 and 1.1 pCi/mg respectively) indicates that most of the innoculated Cs-137 entered the soil through the roots rather than by transfer from rainfall or litter fall. This conclusion is also supported in that soil (< 0.250 mm) separated from fine roots by ultrasonics contained nearly twice the Cs-137 concentration of that separated from bark, small stones, etc. The 1969 soil sampling indicated that some downward accumulation of Cs-137 occurred after 1962; for example, the concentration at soil depth of 14 cm (0.67 pCi/mg) in 1969 was higher than the 0.31 pCi/mg determined at a

depth of 9 cm in 1962. Also, in the 1969 sampling there was no evidence of a Cs-137 concentrating phenomenon at the 6-cm depth as there was in the 1962 sampling. Separates obtained through density gradient zonal centrifugation indicated greater than 90% of the Cs-137 on soil is associated with the mineral soil components. Of the mineral component, the bulk of the Cs-137 appears to be associated with the predominant soil clay minerals, kaolinite and chlorite; however, there does seem to be a certain amount of selective concentration of Cs-137 in the micaceous minerals. (See also W74-05181) (Houser-ORNL)
W74-05193

PERSISTENCE OF RADIONUCLIDES IN SOIL, PLANTS, AND SMALL MAMMALS IN AREAS CONTAMINATED WITH RADIOACTIVE FALLOUT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
E. M. Romney, W. A. Rhoads, A. Wallace, and R. A. Wood.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 170-176, (1971), 1 fig, 7 tab, 32 ref.

Descriptors: *Radioecology, Radioactivity, Ecology, *Soil contamination, Small animals(Mammals), Fallout, Nuclear explosions, *Cesium, *Strontium, Sorption, Testing, Movement, Abiotic environment, Biota, Biorhythms, Food chains, *Radioisotopes, Root systems.

The persistence of radionuclides in soil, plants, and small mammals was investigated periodically in areas contaminated with fallout from aboveground nuclear detonations at the Nevada Test Site. Study sites were established at various locations out to about 225 km from ground zero. Emphasis was placed upon the movement of Sr-90 and Cs-137 from abiotic to biotic components. Several neutron activation products also were studied in fallout areas located within 5 km of nuclear excavation tests. Radio-nuclides continued to be taken up through plant roots in small amounts, as time progressed, and some continued to be deposited on foliage as resuspended dust particles. The inhalation route of entry became less important with passing time, whereas ingestion continued to be the most important route through which radionuclides entered small mammals living in old fallout areas. Long-lived Sr-90 accumulated primarily in bone tissue, while Cs-137 accumulated in muscle and soft tissue. Most of the neutron activation products are short-lived, but among those found in animal tissues were isotopes of Co, Mn, and W. Findings indicate that Sr-90 and Cs-137 will continue to move in small amounts from abiotic to biotic components in fallout-contaminated areas with passing time. (See also W74-05181) (Houser-ORNL)
W74-05194

CYCLING OF STABLE CESIUM IN A DESERT ECOYSTEM,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
A. Wallace, E. M. Romney, and R. A. Wood.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 183-186, (1971) 5 tab, 30 ref.

Descriptors: *Cesium, *Cycling, *Ecosystem, *Deserts, Ecology, Radioecology, Activation energy, Assay, Cycles, *Potassium, Soils, Plant pathology, Mammals, Potassium radioisotopes, Absorption, Circulation, Movement, Dispersion, *Path of pollutants.

Contents of stable Cs in several compartments of desert ecosystems represented at the Nevada Test Site have been determined by neutron activation. Potassium in the same compartments has also been determined, and Cs:K discrimination under natural conditions has been evaluated. From compartment sizes some estimates have been made on the rates of Cs cycling through the systems. The rates were low, but the stable Cs was circulating. Compartments studied include soil, several different plant species, arthropods, reptiles, and mammals. The contents of Cs within compartments were in the nanogram per g of dry weight range. There appeared to be a progressive narrowing of the K/Cs ratio going from plants to reptiles and mammals. The addition of stable Cs as CsCl to a soil obtained from the Nevada Test Site resulted in leaf contents in Atriplex canescens of 0.0279, 0.580, 5.15, and 24.0 ppm per g of dry weight for application rates of 0,5, 20, and 50 ppm respectively. The applied Cs was slightly more available than was the original soil Cs. Stable Cs is freely circulated in ecosystems, although at levels lower than that of K by a factor of over 100,000. The stable Cs will have an influence in the cycling of Cs-137. (See also W74-05181) (Houser-ORNL)
W74-05195

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
W. A. Thomas.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 187-189, (1971) 2 tab, 7 ref.

Descriptors: Trees, *Hickory, *Radioisotopes, Absorption, Cycling nutrients, Foliar, Maple trees, Oak trees, Assay, Radioactivity, Soils, Plant-soil-water relationships, *Cobalt, Seeds, *Cesium.
Identifiers: *Blackgum seedlings, *Rare-earth elements, Seedlings.

Mockernut hickory (Carya tomentosa) trees accumulate the rare-earth elements, and black gums (Nyssa sylvatica) accumulate cobalt, resulting in foliar concentrations several orders of magnitude greater than those of other trees on the same site. To compare absorption rates, seedlings of these species and ones of red maple (Acer rubrum), tulip tree (Liriodendron tulipifera), and white oak (Quercus alba) were grown for 35 days in nutrient solution and in soil, both inoculated with Ce-144 and Co-60. The 'index of selective absorption,' defined here as the amount (dpm) of isotope transported to above-ground plant parts per 100 ml of nutrient solution absorbed by roots, compensates for differences among individuals in the volume absorbed. The Carya index for Ce-144 significantly exceeds ($P < 0.01$) the values for the other species both in soil (Carya 6720 plus or minus 1900; Acer 620 plus or minus 90; Liriodendron 320 plus or minus 50) and insolution (Carya 4590 plus or minus 450; Acer 770 plus or minus 430; Liriodendron 720 plus or minus 350; Nyssa 650 plus or minus 190; Quercus 170 plus or minus 40) in spite of large variation about the means. An insufficient number of Nyssa and Quercus seedlings survived in soil to permit valid statistical analyses. Nyssa and Carya indices for Co-60 in solution both significantly surpass ($P<0.50$) the indices for the other species but do not significantly differ from each other (Nyssa 5110 plus or minus 950; Carya 4470 plus or minus 890; Acer 990 plus or minus 500; Quercus 780 plus or minus 300; Liriodendron 410 plus or minus 130). Comparison of the index between treatments - soil versus solution - shows no significant difference for any species for either isotope. (See also W74-05181) (Houser-ORNL)
W74-05196

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
J. R. Kline, C. F. Jordan, and R. C. Rose.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 190-198, (1971) 4 fig, 16 ref, 2 tab.

Descriptors: *Transpiration, *Evapotranspiration, Measurement, *Moisture uptake, Transfer, *Red pine trees, Tritium, Water, Tracers, Water vapor, Air, Soils, Temperature, Thermal properties, Soil-water-plant relationships.
Identifiers: *Tritiated water.

Tritiated water was used to measure transpiration by red pines (Pinus resinosa) in the field throughout a growing season. The method used is based on previously published theoretical analyses of tracer dynamics in steady-state flowing systems. Transpiration began in the spring only when the soil was completely thawed, even though air temperatures had previously been above freezing for considerable periods of time. Spring transpiration averaged 0.3 cm/day for the forest stand. A maximum value of 0.8 cm/day was found in mid-June at a time when available soil moisture was not rate limiting. In August as soil moisture became depleted, average transpiration rate fell to 0.4 cm/day. Total seasonal consumption of water by the forest from April 1 to October 31, 1970, was 91.4 cm. Rainfall input during the same period was 82.5 cm, indicating only a minor moisture deficit for this growing season. Actually, measured seasonal values agreed well with estimates obtained by solution of Penman's equation and from the evaporation equivalent of net radiation. (See also W74-05181) (Houser-ORNL)
W74-05197

TRITIUM MOVEMENT IN AN OLD-FIELD ECOSYSTEM DETERMINED EXPERIMENTALLY,
Argonne National Lab., Ill.
C. F. Jordan, J. R. Kline, and D. S. Sasscer.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 199-203, (1971) 7 fig, 7 ref.

Descriptors: *Tritium, Movement, *Ecosystems, *Ecological distribution, Vertical migration, *Path of pollutants, Absorption, Roots, Water pollution, Soil contamination, Vegetation, Rain water, Diffusion, Model studies, Hydrologic models, Computer models, Adsorption, Clays, Evapotranspiration.

Tritium movement through an old-field ecosystem was studied in order to better understand how water behaves while inside various ecosystem compartments, and also to validate a mathematical model of tritium movement in ecosystems. Tritiated water was applied to field plots, and was collected at various depths in the soil and from the vegetation at approximately weekly intervals. The experimental results confirmed the following computer predictions: A pulse of tritium will move downward through the soil as a function of the amount of rainwater entering the soil above the pulse. Simultaneous with downward movement, the peak will broaden and flatten due to diffusion. The pulse will become immobilized if the upper soil dries out to the extent that rainwater does not penetrate to the depth of the pulse peak. Concentrations of tritium in vegetation will be equal to concentrations in the soil water at the depth at which the plant is taking up water. Loss of tritium from the system will occur by evapotranspiration and deep drainage. The computer predictions departed from the experimental results because of two phenomena not included in the model: (1) direct transfer of tritium to lower levels of soil via root and worm holes; (2) absorption of tritiated hydroxyl groups onto clay particles. (See also W74-05181) (Houser-ORNL)
W74-05198

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
C. Myttenaere, and U. Marckwordt.

In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 212-217, (1971) 1 fig, 6 tab, 17 ref.

Descriptors: *Soil contamination, *Rice, *Cereal crops, *Cesium, *Cobalt, *Strontium, Absorption, Roots, Lysimeters, Data collections, Irrigation, Water pollution, Flood irrigation, Behavior, Ecology, Cation exchange, Oxidation-reduction potential.

Rice soils retain a high percentage of radionuclides transported by irrigation water. The accumulated radioactivity can partly be released to the roots of lowland rice. In order to establish the influence of water regime on the indirect radiocontamination of rice, the availability in soils and the absorption of plants of Cs-134, Sr-85, and Co-60 were studied during three successive years (1967, 1968, 1969), using the same variety in flooded and nonflooded conditions. The experimental conditions of the rice culture in lysimeters were checked with data collected in an irrigated rice field. Radiostrontium and radiocesium absorption by plants was not greatly influenced by the different water regimes. Radiocobalt level of plants was considerably higher in flooded rice and thus reflected the increased availability of Co in flooded soils. Concentration factors varied with the radionuclide and the plant organ. The variations in specific activity of radioisotopes in the plant underline a different behavior of the radioactive and stable isotope in the soil. Under these experimental conditions, only cations, the solubility of which depends directly on the redox state of the soil, were more available and were taken up by the rice plants. (See also W74-05181) (Houser-ORNL)
W74-05199

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
D. F. Grigal.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 218-224, (1971) 3 fig, 2 tab, 16 ref.

Descriptors: *Calcium, Cycles, *Cycling nutrients, *Forest soils, Hickory trees, Oak trees, Maple trees, Ecosystems, Soil contamination, Water pollution, *Radioactivity, Movement, Soil water, Soil water movement, Diffusion, Vertical migration, Vegetation, Absorption, Transfer, Lysimeters, Cation exchange.

Calcium-45 was introduced into red maple (Acer rubrum L.) trees in spring, and the leaves were harvested in autumn and laid on the floor of an oak-hickory forest. Movement of Ca-45 from the leaves into other components of the ecosystem, and particularly into the soil and soil-water systems, was monitored for two winters and the intervening summer by periodic sampling of soil, litter, and soil-water. After 72 weeks, approximately 50% of the Ca-45 had moved into the soil. Activity of the isotope decreased exponentially with depth and little had moved below 20 cm. Some of the isotope had also cycled through the surrounding vegetation and back to the soil surface. The Ca-45 did not move into the soil in solution but instead moved by surface or exchange diffusion along the soil particles. A grain-boundary diffusion model, which infers rapid diffusion along pores and slow diffusion into soil peds, was used to predict this movement. The Ca-45 initially introduced into the system is accounted for by that observed in the litter and that predicted by the model in the soil. The results imply that studies which emphasize soil solution, as with tension lysimeters, may not provide sufficient information with which to describe movement of naturally incorporated cations from leaf litter into soil. The results further indicate that after introduced fertilizer cations are initially fixed either chemically by the soil or biologically by the macro- and microflora, losses of such cations from the system are likely to be small. (See also W74-05181) (Houser-ORNL)
W74-05200

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON THE NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
For primary bibliographic entry see Field 5C.
W74-05212

NUTRIENTS FROM TILE DRAINAGE SYSTEMS, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
Copy available from GPO Sup Doc as EP1.16:13030 ELY5/71-3, $1.00; microfiche from NTIS as PB 216 552 $1.45. Water Pollution Control Research Series, May 1971. 90 p, 18 tab, 29 tab, 30 ref. EPA Project 13030 ELY 05/71-3.

Descriptors: *Farm wastes, Path of pollutants, Water pollution sources, *Tile drainage, Nutrients, *Nitrates, *Phosphates, Denitrification, Fertilization, Irrigation practices, *California.
Identifiers: *San Joaquin Valley(Calif), *Composited drainage, *Nutrient variability, Indigenous nutrients, Residual nitrogen.

Tile drainage systems of the San Joaquin Valley were monitored for nutrients (nitrogen and phosphorus) to determine the algal growth potential (AGP) of the waste, and the degree of treatment required for removal of AGP. The objectives were to determine: (1) the average nutrient concentrations in tile drainage, (2) the magnitudes of annual, areal and seasonal variability of nutrients and discharges, (3) if a possible correlation exists between nutrients and agricultural practices, and (4) if existing soil conditions influence nutrient concentrations and flows. Average discharges and nutrient concentrations were calculated for different years, months and areas of interest (valleywide, major tiled areas, physiographic positions and soils). Average nutrient concentrations in the composited drainage from the Valley were found to be 19.3 mg/l for nitrogen (NO3-N) and 0.09 mg/l for phosphorus (PO4-P); average discharge was 1.4 ac-ft/ac/yr. Nutrient levels in the composited drainage did not change appreciably with time. Variability of nutrients was observed for different seasons; a twofold decrease in nutrients was attributed to dilution by irrigation and denitrification. N was three times more concentrated in drainage from one out of four major tiled areas investigated. The high N levels were attributed more to indigenous concentrations in certain alluvial fan soils and their parent materials than fertilization. Low N levels found in drainage from basin soils were believed caused by denitrification. P was seven times higher in the drainage from the southernmost area than the other areas investigated. These extraordinarily high levels (0.69 mg/l) were attributed to indigenous concentrations in certain soils made available by anaerobic soil conditions. High discharge in the northernmost area (2.3 ac-ft/ac) was believed to be caused by rapid laternal hydraulic conductivity and surrounding irrigation influence. (EPA)
W74-05229

SUBSURFACE BIOLOGICAL ACTIVITY IN RELATION TO GROUND WATER POLLUTION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
W. J. Dunlap, and J. F. McNabb.
Copy available from GPO Sup Doc as EP1.23:660/2-73-014, $0.90; microfiche from NTIS as PB-227 990 $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-014, September 1973. 60 p, 6 tab, 103 ref. EPA Project 21 AKQ-10.

Descriptors: *Groundwater, *Subsurface investigations, *Microbiology, *Subsurface waters, Habitats, Water pollution, Water pollution effects, Path of pollutants, Zone of aeration, Zone of satu-

ration, Biological communities, Biodegradation, Temperature, Hydrostatic pressure, Anaerobic bacteria.
Identifiers: *Subsurface microbiology, *Subsurface environment, Microbial activity.

Biological activity occurring in subsurface regions below the soil zone may be of considerable importance in determining the fate and effect of pollutants in ground water, but this possibility has received little previous attention. A discussion is presented of subsurface biological activity in regard to ground-water pollution as reflected by available literature references. The subsurface environment is discussed in terms of factors likely to be of greatest significance in regard to the development of biological systems, and previous investigations of subsurface microbial activity are reviewed. Available information indicates the presence in the upper continental crust of the earth of numerous regions, particularly those of sedimentary origin, which are probably suitable habitats for many microbial species. Previous investigations of subsurface microbial activity clearly show the presence of diverse microbial populations in many subsurface regions below the soil zone. Hence, microbial activity appears both possible and probable in most subsurface regions of importance in regard to ground water. Further elucidation of the extent and nature of microbial activity in subsurface regions is needed in developing methods for predicting the impact of pollutants on ground-water quality. (EPA)
W74-05230

CONTENT AND COMPOSITION OF ORGANIC MATTER IN SOD PODZOLIC AND SOD SANDY SOILS OF DIFFERENT DEGREES OF WETTING, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05237

REGIONAL ENVIRONMENTAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla.
Indian Nations Council of Governments, Tulsa, Oklahoma, June 1972. 59 p, 1 fig, 11 tab, 5 ref. CPA OK 0656 1012.

Descriptors: *Data storage and retrieval, *Environmental control, *Computer programs, *Pollution abatement, *Urban sociology, Data processing, Planning, Pollutants, Information retrieval, Air environment, Water pollution control, Soil environment, Solid wastes, Waste water(Pollution), Data collections, Urbanization.
Identifiers: *Environmental impact, *Tulsa(Oklahoma), Impact assessment.

The Indian Nations Council of Governments is developing a computerized file containing all pertinent information with respect to environmental protection by providing inventories of all emissions to the ambient atmosphere, all effluents to the Region's streams, all industrial wastewater sources, all potable water sources and treatment plants, and all solid waste collection systems and disposal sites. Summaries are presented of the inventories along with a preliminary analysis of the data. Included is the second phase of the Environmental Data File (Coding Manual) consisting of computer forms, coded structures, instructions for coding, and an example computer retrieval. Some of the data items included in the seven sub-files are: industrial air contaminant emissions, industrial wastewater sources and effluents; industrial solid waste quantities; major sewage treatment facility capacities, discharge volumes and pollutional loads; water treatment plant capacities; solid waste landfill capacities; and proposed development data items. The data are structured for ease of integration into existing files, as well as ease of updating. The file will provide information on pollution problems necessary for making assessments of their environmental impact on various systems. The data can be used for systems models which are being developed for various public improvements. This is a continuing study designed to provide the framework for a complete data system on environmental pollution. The data system will be used for environmental impact assessment, water and sewerage planning, solid waste management, and many other planning functions. (Poertner)
W74-05239

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
R. J. Cross.
Chemistry and Industry, No 15, p 719-721, Aug 4, 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Mercury, Pollutants, *Water pollution sources, *Toxicity, Water pollution control, Chemcontrol, Biocontrol, Adsorption, Bacteria, Sediments, Environmental control, Environmental effects, Industrial wastes, Pollution abatement, Aquatic microorganisms, Aquatic bacteria, Bacteria, Benthic flora, Water chemistry, Enzymes, Chemical reactions, Economic feasibility, Dredging, Clams, Aquatic animals, Benthic fauna.
Identifiers: *Mercury compounds, Methyl mercury, Dimethyl mercury, Lewis acids.

The oceans contain about 100 million tons of Hg, many times the total volume mined, used, and dispersed by man, without threatening global poisoning. The isolated cases of pollution-caused Hg poisoning on record, as in chemical laboratories, are caused by locally high concentrations. The main ecological problem is due to Hg in surface waters. Its most dangerous source is the effluent from Cl-alkali factories. Oxidation converts Hg metal into Hg(II) ion which is rapidly adsorbed on bottom sediments, but gradually converted to methyl- and/or dimethyl mercury compounds, mainly by the methylcobalamine coenzyme contained in benthic microorganisms. Of several proposed methods for removal of Hg or the coenzyme from waterways (such as dredging, application of Lewis acids, biological conversion by Pseudomonas bacteria, and cultivation of clams in polluted waters), none seems as practicable or economical as the preventive approach of avoiding the entrance of Hg into waters in the first place. (Brown-IPC)
W74-05248

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
W. Flaig.
Chemistry and Industry, No 12, p 553-554, June 16, 1973. 2 fig, 3 ref.

Descriptors: *Fertilizers, *Lignins, *Sulfite liquors, *Pulp wastes, *Nitrogen compounds, Ultimate disposal, Solid wastes, Liquid wastes, *Byproducts, Ammonium compounds, Nitrates, Organic compounds, Solubility, Industrial wastes, Waste disposal, Pulp and paper industry, Soil amendments.
Identifiers: Spent sulfite liquors, 'N-Lignin'.

A soluble fertilizer called N-Lignin was prepared by concentrating spent sulfite pulping liquor to 20% solids content and then heating it at 125 C and 12 atm pressure for 1-2 hr with oxygen and ammonia, followed by evaporation and spray drying. The product contained ca. 5% ammonia-nitrogen, 1% amide-nitrogen, and 6% other organic nitrogen. The N-Lignin was not readily leached from soil, because ca. 45% of the N was bound to high-molecular-weight substances. Good results were obtained in potted plant tests with N-Lignin alone or in 1:1 mixtures with ammonium nitrate. (Buchanan-IPC)
W74-05249

A STARCH-FREE EFFLUENT PROGRAM FOR CORRUGATING PLANTS,
Canada Starch Co. Ltd., Montreal (Quebec).
J. M. L. Currie.
CPPA (Canadian Pulp and Paper Association) Technical Section Proceedings, 1972. p D22-D24.

Descriptors: *Carbohydrates, *Industrial wastes, *Pollution abatement, Water pollution sources, *Pulp wastes, *Adhesives, Equipment, Operation and maintenance, Waste water(Pollution), *Canada, Effluents, Biochemical oxygen demand, Discharge(Water).
Identifiers: Starch, Gluing, Converting industry, Corrugated boards, Corrugated containers, Materials handling, Wash waters.

Starch can reach the sewers of a corrugated board or box factory as a result of faulty equipment, improper operation, and carelessness. The points at which starch is being lost in an adhesive gluing system have been studied at Canada Starch Co. Ltd. and included dry spills, system leaks, overflows, cleanups, and the use of nonstandard-quality batches of corrugating adhesives. Corrective measures by way of equipment modifications and improved handling and operating techniques are discussed. Specific remedies must be adapted to the specific conditions of each factory. No general panacea is possible. (Brown-IPC)
W74-05250

METHANOL DISTRIBUTION IN AN EVAPORATION PLANT,
Billeruds A.B., Saffle (Sweden).
For primary bibliographic entry see Field 5D.
W74-05253

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
For primary bibliographic entry see Field 5D.
W74-05255

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-05278

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
M. E. Johnson.
Available from the National Technical Information Service as PB-222 173, $3.00 in paper copy, $1.45 in microfiche. Supplementary Report No 1 to VP-X-100, June 1973. 10 p. 1 tab, 67 ref.

Descriptors: *Lumbering, *Wood wastes, *Industrial wastes, *Environmental control, *Water pollution sources, *Air pollution, *Bibliographies, Forest management, Forest fires, Waste water treatment, Treatment facilities, Canada, Waste disposal, Solid wastes, Equipment, Environmental effects, Pollution abatement, Waste water treatment, Saw mills.
Identifiers: Noise, Scenic pollution, Plywood industry, Wood industry, Forest products industry, Wood preservatives, Logging machines.

This supplement to an earlier annotated bibliography provides references (with abstracts) to the literature acquisitioned at the library of the Western Forest Products Laboratory between July 1972 and June 1973, dealing with water, air, noise, and/or scenic pollution of the environment caused by logging, log handling, and the manufacture of lumber, plywood, and other forest products other

than pulp and paper. (See also W73-03746) (Brown-IPC)
W74-05284

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
T. Flaim.
Available from the National Technical Information Service as PB-224 063, $3.00 in paper copy, $1.45 in microfiche. Paper prepared for the Assembly Scientific Staff of the New York Legislature. Nov. 17, 1972. 26 p. 3 tab, 28 ref.

Descriptors: *Pollution abatement, *New York, Agriculture, *Industrial wastes, Food processing industry, *Farm wastes, Dairy industry, *Pesticides, Air pollution, Water pollution sources, Sedimentation, Nutrients, Legislation, *Law enforcement, Research priorities.

A survey of the location, magnitude, and control of agricultural pollution problems in New York State led to the following findings: (1) Agriculture generates over 50% of the total waste volume produced annually in the USA, yet its contribution to pollution is relatively minor. (2) In decreasing order of importance, agricultural pollution sources in New York State come from food processing, animal (farm) wastes, dairy feedlots, sedimentation, plant nutrients, pesticides, and agricultural air pollution. (3) Compared to other industries, agricultural activity is diverse; hence agricultural pollution is difficult to measure, and any legislative control difficult to enforce. (4) Existing technology is adequate for controlling agricultural pollution, except food-processing wastes. Needs for further research are pointed out, and implications of this study for policy-making legislators are indicated. (Brown-IPC)
W74-05285

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 5A.
W74-05287

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 5A.
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
W. F. Ritter, H. P. Johnson, W. G. Lovely, and M. Molnau.
Environmental Science and Technology, Vol 8, No 1, p 38-42, January 1974. 8 tab, 11 ref.

Descriptors: *Pesticide residues, *Agricultural watersheds, *Pesticide kinetics, *Triazine pesticides, *Phosphothioate pesticides, *Chlorinated hydrocarbon pesticides, Small watersheds, Degradation(Decomposition), Surface runoff, Movement, Water pollution sources, Persistence, Soil analysis, Bottom sediments, Watersheds(Basins), Water analysis, Diazinon, Loess, Soil profiles, Insecticides, Herbicides.
Identifiers: Fate of pollutants, Pesticide loss, Chemical concentration, Atrazine, Propachlor, Electron capture gas chromatography, Sample preparation.

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), propachlor (2-chloro-N-isopropylacetanilide), and diazinon (0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate) losses in sediment and surface runoff were measured from four watersheds ranging in size from 1.9-3.8 acres and located in the loessial soil region of western Iowa. Two of the watersheds were planted to ridged corn, and two were planted to surface-contoured corn. Movement of atrazine, propachlor, and diazinon in the soil profile and degradation of these pesticides were measured. Water and sediment samples were obtained from the four watersheds with single-stage sediment samplers. All water and sediment samples were collected in glass bottles, transferred to polyethylene bottles, and frozen immediately after collection. Soil samples were taken within 24 h after pesticide application and at 7-day intervals for the first few weeks. The Geigy Chemical Corp. (1965) ultraviolet method was used for atrazine analysis. Propachlor and diazinon were determined by electron capture gas chromatography. Pesticide losses were much greater from the surface-contoured watersheds than the ridged watershed. Significant amounts of surface-applied atrazine and propachlor were removed from the surface-contoured watersheds by storms occurring shortly after the pesticides were applied. Insignificant amounts of diazinon were removed in the surface runoff and sediment. Generally, pesticide concentrations were higher in the sediment than in the runoff water; however, greater total losses were associated with the greater volume of water. (Holoman-Battelle)
W74-05295

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2358-2371, November 1973. 16 fig, 8 ref.

Descriptors: *Coliforms, *Mathematical models, *Michigan, *Distribution patterns, Water temperature, Industrial wastes, Sewage, Flow, Water quality, Bays, Water pollution effects, Waste disposal, Equations, Dispersion, Seasonal, Mortality, Boats.
Identifiers: *Grand Traverse Bay(Mich), Boardman River, Survival.

A predictive model for total coliform bacteria in Grand Traverse Bay, Michigan, has been developed using continuity equations with a simple fluid transport model and temperature-dependent first order kinetics. The model has been verified over a wide range of loadings during a period of several years with data obtained during numerous field surveys. The model has been applied to a number of water quality control problems of interest to local planners and others, such as defining the role of storm sewer discharges to the bay, the effects of additional areas for development, and the discharge of wastes from private watercraft. (Mortland-Battelle)
W74-05328

ENERGY AND THE ENVIRONMENT--ELECTRIC POWER.
Council on Environmental Quality, Washington, D.C.
Available from NTIS, Springfield, Va. 22151 - PB-223 326 - Price $3.00 printed copy; $1.45 microfiche. Report, August 1973. 58 p, 13 fig, 18 tab, 1 append.

Descriptors: *Water pollution sources, *Electric powerplants, *Air pollution, *Environment, *Thermal powerplants, Costs, Electric power production.

The use of energy damages the environment not only when it is used but also when it is extracted, processed, transported, and distributed to the consumer. The production and use of energy pollute air, befoul streams, and damage land. And as the use of energy has multiplied, so have the attendant environmental impacts. The conflict between energy needs and the environment poses a problem that must be solved by understanding the factors that influence demands for energy and by developing energy systems that meet these demands with minimal damage to the environment. The elements underlying the growing demand for energy and the environmental implications of the complex energy systems for meeting this demand are examined. Focus is on electric energy because of the particularly rapid growth in this sector. Improved efficiency of energy systems and energy conservation will reduce environmental damages and slow use of energy resources. Electric energy demand forecasts can be combined with data on the environmental impacts of each electric energy system to yield an estimate of projected environmental consequences. (Knapp-USGS)
W74-05330

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-05332

RELIABILITY AND ECONOMIC OPTIMIZATION FOR URBAN RETURN FLOWS MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
C. S. Shih, J. K. Garner, and G. L. Curry.
Water Resources Bulletin, Vol 10, No 1, p 101-118, February 1974. 8 fig, 5 tab.

Descriptors: *Optimization, *Water pollution control, *Urban runoff, Systems analysis, Economics, Probability, *Texas, Water management(Applied).
Identifiers: *San Antonio(Tex.).

Reduction of pollution to urban water resources by runoff was studied as a water-quality management problem. An optimization model was developed for determination of the best pollution control policies for each treatment facility in terms of the minimization of total regional cost requirements, the quality control requirements, and the reliability desired. A change-constrained quadratic programming technique coupled with parametric analysis is utilized as the basic solution approach. A practical problem based on the situation existing in the San Antonio River basin region of Texas was used for the illustration of this application. (Knapp-USGS)
W74-05333

NUMERICAL AND ANALYTICAL SOLUTIONS OF DISPERSION IN A FINITE, ADSORBING POROUS MEDIUM,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Water Resources Bulletin, Vol 10, No 1, p 81-90, February 1974. 1 fig, 6 ref.

Descriptors: *Dispersion, *Path of pollutants, *Porous media, *Numerical analysis, Mathematical models, Groundwater movement, Adsorption.

Numerical and analytical solutions are developed for the distribution of a contaminant within an adsorbing porous medium in a unidirectional flow field subject to a step function for input concentration. The medium is considered to be homogeneous, isotropic, and areally finite. As a byproduct, solutions are also obtained for the case of a nonabsorbing porous medium. An example that demonstrates the applicability of the solutions is presented. (Knapp-USGS)
W74-05334

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
H. B. Pionke, and O. D. Workman.
Water Resources Bulletin, Vol 10, No 1, p 66-80, February 1974. 6 fig, 2 tab, 7 ref.

Descriptors: *Salinity, *Evaporation, *Reservoirs, *Oklahoma, Water quality, Water pollution sources, Seepage, Saline water, Flood control, Water chemistry, Impoundments.

The effect of hydrologic and chemical processes on salinization of stored waters was determined for two small floodwater-retarding structures located in western Oklahoma. One structure, designed to accommodate a large influx of sediment, was overdesigned (operated at reduced capacity) by upstream diversion of approximately one-half the inflow. Over a 2-year period, the total salinity of stored waters increased approximately 22 times, and the stored water volume decreased to 1/33 its initial volume in the overdesigned (underused) structure, while both volume and salinity of stored waters remained comparatively stable in the other structure. The lack of sufficient dilution by better quality surface runoff and the increased residence time of water in the impoundment apparently caused most of the salinity increase. The bulk of the salt load entering the overdesigned structure, to be concentrated later by evaporation, was associated with base rather than storm inflow. After base inflow ceased, substantial losses of salt load and stored water occurred concurrently. The loss was not adequately explained by chemical precipitation in association with evaporation. Seepage and evaporation appeared to account for much of the hydrologically unexplained loss of stored waters. (Knapp-USGS)
W74-05335

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
W. M. Warren.
Water Resources Bulletin, Vol 10, No 1, p 22-31, February 1974. 4 fig, 12 ref.

Descriptors: *Subsidence, *Lagoons, *Water pollution sources, *Sinks, Karst hydrology, Limestones, *Carbonate rocks, Land subsidence, Subsurface drainage, Path of pollutants,
Identifiers: Subsurface erosion, Retention basins.

Sinkholes and subsidence occur in areas subject to dewatering of carbonate formations. Excessive groundwater pumpage is a causative factor in areas of increased sinkhole activity. Subsurface erosion of unconsolidated materials underlain by carbonate rocks is one cause of the collapses. Infiltrating water from retention basins may cause subsurface erosion and eventual failure by collapse of the structure. The resulting groundwater contamination would be great as the pollutants spread throughout the solution-cavity system. (Knapp-USGS)
W74-05337

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
For primary bibliographic entry see Field 5C.
W74-05342

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
Yu. Magriso, B. Danailov, G. Peshakov, and A. Georgiev.
Agrokhimiya. 4, p 56-60. 1972. Illus.
Identifiers: *Fertilizers, *Grapes, Manure, Microorganisms, *Nitrogen, Nutrition, Pea, Rye, Crop yield.

Experiments performed on black-soil, plowed-under with a pea-rye-green manure mixture, increased the amount of assimilated N and the number of beneficial microorganisms. These factors, with an optimal water regime, increased the harvest of grapes without loss of quality.--Copyright 1973, Biological Abstracts, Inc.
W74-05346

DRUG RESISTANCE OF COLIFORM BACTERIA IN HOSPITAL AND CITY SEWAGE,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, and O. W. Prozesky.
Antimicrob Agents Chemother, Vol 3, No 2, p 175-180, 1973.
Identifiers: Ampicillin, Bacteria, Chloramphenicol, *Coliform bacteria, *Drug resistance, *Environmental, Escherichia-coli, Infect-drugs, Pollution, *Salmonella-typhi, *Sewage, Streptomycin, Sulfonamide, Tetracycline.

The number and properties of drug-resistant coliform bacteria in hospital and city sewage were compared. There was little difference in the counts of organisms with nontransferable resistance to 1 or more of 13 commonly used drugs. An average of 26% of coliforms in hospital waste water had transferable resistance to at least one of the drugs ampicillin, chloramphenicol, streptomycin, sulfonamide or tetracycline as compared to an average of 4% in city sewage. R+ bacteria in the hospital discharge were also resistant to a broader spectrum of drugs than those in city sewage. In both effluents, the occurrence of fecal Escherichia coli among R+ coliforms was twice as high as among coliforms with nontransferable resistance. Resistance was transferable to Salmonella typhi, and such drug-resistance pathogens in the water environment could be of particular concern. The significance of the results with regard to environmental pollution with R+ bacteria and the dissemination of these organisms is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-05361

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
For primary bibliographic entry see Field 5A.
W74-05362

PHYSIOECOLOGY OF THE UMSINDUSI RIVER WITHIN THE PIETERMARITZBURG CITY LIMITS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Botany.
L. J. Nash, C. H. Bornman, and J. Heeg.
Trans R Soc S Afr, Vol 40, No 3, p 197-208, 1972, Illus.
Identifiers: *Bacteriology, Ecology, *Physioecology, Pollution, Rivers, *South Africa(Umsindusi River), Cities, *Domestic wastes.

A physioecological study of the Umsindusi River at Pietermaritzburg (South Africa) was carried out to estimate the changes in composition taking place during its passage through the city. While little evidence of gross industrial pollution was found, there was a marked enrichment of many constituents, particularly organic substances. A number of sources contribute to the pollution of the Umsindusi, and while this pollution is at present within the self-purification capacity of the river, recovery is slow, and the chemical and bacteriological quality of the water leaving Pietermaritzburg is poor.--Copyright 1973, Biological Abstracts, Inc.
W74-05363

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1973. 448 p, 39 fig, 12 tab, 200 equ, 228 ref. R. A. Deininger, Ed. Price: $24.50.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Water supply, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

The use of mathematical models and systems analysis techniques is considered for the control of environmental pollution and resources development. These methods allow decision makers to screen the various control technologies and procedures and to select those which are most efficient. The book, written by an international group of experts, is organized in six major parts: (1) water pollution control; (2) water supply and water resources development; (3) air pollution control; (4) solid waste disposal; (5) noise control; and (6) total environmental models. Each of these sections contains one or more individual papers. Overall, the book summarizes the present state-of-the-art in mathematical modeling for environmental pollution control. Included are a description of a river basin model and numerous alternate strategies available for improving the river's water quality, a paper dealing with regional sewerage systems, a discussion of ecological aspects of water quality models, the design of water supply systems, a consideration of the economic consequences of constructing weirs and canals, results of air quality modeling studies of cities in Germany, experiences with vehicle routing models in the United Kingdom, the introduction of mathematical modeling and formal optimization techniques to noise pollution, an overall environmental quality model, and an analogy between the safeguard of nuclear materials and environmental pollution control. (Bell-Cornell)
W74-05386

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5G.
W74-05387

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5D.
W74-05389

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.
D. E. Pingry, and A. B. Whinston.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 61-90 (Chapter 3), 1973. 2 fig, 4 tab, 1 map, 71 equ, 20 ref, 3 append.

Descriptors: *Water quality control, *Water temperature, *Dissolved oxygen, *Indiana, *Water

pollution treatment, *Costs, *Simulation analysis, Information retrieval, Optimization, Resource allocation, Comprehensive planning, River basins, Regional analysis, Effluents, Economic efficiency, Alternative water use, Biochemical oxygen demand, Thermal pollution, Waste water(Pollution), Cooling towers, Flow augmentation, Constraints, Computer programs.
Identifiers: *West Fork White River(Ind.), *External effects, Regional planning, Opportunity costs, By-pass piping, Treatment plants, Nonlinear programming.

The information problem when dealing with external effects of water pollution is immense. Usually the external effect (cost or benefit) is transferred to the affected party through a complex series of physical, chemical or biological processes; an initial effluent discharged by a polluter may affect a downstream user, and in such a case the opportunity costs of a specific resource allocation are not at all clear. This has led to attempts to produce the effects of resource allocation under external effects by modeling the appropriate physical system. Moreover, since different policies are appropriate for different polluters--uniform rules cause significant inefficiencies--a regional approach (thus various treatment strategies) is being considered. Presented is a simulation model of river basin water quality that serves as the constraint set for an optimization model which searches for the efficient solutions given the quality goals. The model explicitly considers water temperature and its relationship to dissolved oxygen; it considers simultaneously several treatment strategies and their costs. The model answers: What is the least cost combination of treatment facilities that will meet given temperature and dissolved oxygen goals. Using such a model, a river basin authority could present an assortment of river use and cost combinations for consideration by the affected parties. (Bell-Cornell)
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W74-05391

MATHEMATICAL MODEL FOR OXYGEN BALANCE IN RIVERS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
G. Chevereau.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 107-136 (Chapter 5), 1973. 14 fig, 28 equ, 11 ref.

Descriptors: *Simulation analysis, *Water quality control, *Oxygen, Rivers, Biodegradation, Diffusion, *Computer programs, Advection, Unsteady flow, Downstream, Reach(Streams), Organic matter, Systems analysis, Mathematical models.
Identifiers: *France(River Vienne), *Streeter-Phelps equation, Finite differences, Paper mills.

A mathematical model is described, based on the Streeter-Phelps equation which has been extended to allow for diffusion. A computer program has been established which simulates unsteady flow in rivers. The parameters of the unsteady flow are introduced into the pollution model in which the Streeter-Phelps equation is approximated in a finite difference form and integrated by the so-called 'two steps explicit method.' Discussed is the testing of the model on the French river Vienne in a reach downstream of a large paper mill, in connection with a specialist team of chemists and biologists. Observance showed a significant discrepancy between the rates of biodegradation of organic matter measured in laboratory tests and those obtained by adjustment of the model. Auxiliary phenomena make the problem more complex so that rational determination of the rate of biodegradation of organic matter is hazardous. Thus, presently, it seems best to evaluate 'bulk rates' of biodegradation by adjustment of a model on observed situations in the river. This method necessitates numerous field measurements and requires great care in extrapolating the results of the model. (Bell-Cornell)
W74-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Bender.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 137-153 (Chapter 6), 1973. 7 fig, 34 ref.

Descriptors: *Water pollution control, *Aquatic environment, *Mathematical models, *Eutrophication, *Biota, *Water quality, Ecosystems, Systems analysis.

Most biological models are too restricted in scope to be directly useful in evaluating pollutant-related stresses in aquatic environments. They are limited since they usually describe only one problem area (trophic level) within the system, and they often must be ramified, at considerable expense, before being applied to other similar environments. However, in specific types of aquatic environments, those stresses considered natural in nature, i.e., those created by oxygen-consuming wastes, are understood sufficiently to allow for the construction of total ecosystem models. Such models can account for the major functional changes such as respiration and nutrient regeneration as being functions of variables such as time and concentration. Although important, however, nonfunctional changes are less easily modeled; also, at the present time we lack sufficient knowledge to build models describing the effects of pollutants of unnatural origin. Bender considers biotic indices and eutrophication in detail to illustrate the current status of practical water quality models that deal with biotic responses. Although the examples presented can at best be considered as subsystem models, they are representative of the types of models being used to solve water pollution problems. (Bell-Cornell)
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor, and D. R. Keeney.
Journal of Environmental Quality, Vol 2, No 4, p 438-440, October-December 1973. 4 tab, 18 ref.

Descriptors: *Hardness(Water), *Nitrogen fixation, *Lake sediments, *Assay, Lakes, *Wisconsin, Sampling, Cycling nutrients, Anaerobic conditions.
Identifiers: *Acetylene reduction, Sample preparation, Lake Wingra, Lake Mendota, Tomahawk Lake, Trout Lake, Crystal Lake, Plum Lake, Lake Minocqua, Little John Lake.

Sediment samples were collected by Ekman dredge from 2 hardwater and six softwater lakes in Wisconsin for use in acetylene reduction tests to obtain a first approximation of the amounts of combined N added to lake sediments by anaerobic N fixation. To conduct the assay, sediment was transferred by syringe to 160-ml serum bottles containing 4-mm glass beads. The bottles were sealed with neoprene septa held firmly in place with aluminum seals. With the aid of hypodermic needles, each bottle was simultaneously flushed with a continuous flow of pure He and shaken so as to completely mix the beads and sediment. Ethylene, acetylene, and methane in the atmosphere above the sediment were determined after 1 and 2 days of incubation by gas chromatography. Rate of acetylene reduction indicated that, on the average, sediments from hardwater and softwater lakes may fix 37 and 7.7 ng of N, respectively, per gram (dry weight) per day. The rate of acetylene reduction diminished in the presence of nitrogenase inhibitors. (Little-Battelle)
W74-05400

5C. Effects Of Pollution

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

THERMAL EFFECTS ON BIOLOGICAL PRODUCTION IN A POND,
Wisconsin Univ., Madison. Dept. of Zoology.
H. F. Siewert.
Available from the National Technical Information Service as PB-228 659 $12.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 172 p, 37 fig, 11 tab, 145 ref. (Issued by University of Wisconsin Water Resources Center, Madison). OWRR A-020-WIS(2). OWRR A-032-WIS(2). 14-01-0001-1870. 14-31-0001-3050.

Descriptors: Water chemistry, *Plant growth, *Chara, *Fishkill, *Nutrients, *Sunfishes, Oxygen, Alkalinity, Conductivity, Hydrogen, Sulfide, Stratification, Temperature, *Wisconsin, *Thermal pollution, Water pollution effects.
Identifiers: Thermal addition, *Fish growth, Food supply.

Physical, chemical, and biological differences between two similar ponds were studied. One pond was heated to 5C above ambient temperature, while the other served as a reference. Two hundred and fifty green sunfish, Lepomis cyanellus, were planted in each pond. The young-of-the-year grew at a higher rate in the heated pond and permitted Chara to grow year round at an accelerated rate. The heated pond produced more oxygen during the day and lost more oxygen during the night than did the reference pond. The

latter showed greater annual fluctuations of total alkalinity and conductivity. Concentration of hydrogen sulfide in the lower half of the water column, caused by stratification within the reference pond, killed fish in both the summer and winter periods. There was an indication that the synergistic effect of temperature and oxygen with an unlimited food supply will promote fish growth.
W74-04861

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
G. Pararas-Carayannis.
Available from NTIS, Springfield, Va 22151 AD-766 721 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum No 39, May 1973. 159 p, 50 fig, 21 tab, 117 ref.

Descriptors: *Water pollution sources, *Water pollution effects, New York, *Municipal wastes, *Continental shelf, Oceans, Environmental effects, Water pollution, *Waste disposal.
Identifiers: *New York Bight.

Short-term studies on effects of ocean dumping in the New York Bight include hydrographic, geological, chemical, biological investigations, and a feasibility study for a remote-controlled electronic sensing system to detect the location and dump status of waste disposal vessels. Circulation patterns were estimated by current meters and by seabed and surface drifters. Chemical analyses were made of the concentration of phosphorus, nitrate, total iron, dissolved oxygen, and chlorophyll-a. Temperature, salinity, turbidity, and pH were measured. Sediment samples were analyzed for organic content and the heavy metals, and biological samples for heavy metals and mercury. Included are studies of benthic meiofauna and macrofauna, zooplankton, finfish and bacteria and disposal of sewage sludge, dredge spoils and acid-iron wastes. Waste disposal results in an increase in the nutrient concentration of the waters of the dumping grounds, and the biochemical oxygen demand of the wastes during summer reduces the dissolved oxygen concentration of bottom waters. The studies defined areas with high carbonaceous content in the sediments, and correlated such carbon-rich deposits with sewage and dredge spoils dumped in the area, and with anomalously high concentration of heavy metals such as silver, chromium, cadmium, copper, lead, nickel, and zinc. The large volume of wastes being dumped in the Bight and frequency of dumping has changed the marine environment of the dumping grounds and adjacent areas. (Knapp-USGS)
W74-04863

ULTIMATE UPPER LETHAL TEMPERATURE OF ATLANTIC SALMON SALMO SALAR L.,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. T. Garside.
Canadian Journal of Zoology, Vol 51, No 8, p 898-900, August 1973. 1 tab, 8 ref.

Descriptors: *Atlantic salmon, *Lethal limit, *Water temperature, *Bioassay, *Thermal stress, Statistical methods, Freshwater, Mortality, *Canada, Water pollution effects.
Identifiers: *Parr, Acclimatization, Probit analysis, Salmo salar, Data interpretation.

Thermal bioassays were conducted on parr of Atlantic salmon ranging from 70 to 147 mm total length (2.1-29.4 g) collected from a segment of 400 m immediately above high-tide elevation in Bio Brook, Terra Nova National Park, Newfoundland, during early July, 1969. Temperature of the brook varied from 16 to 20C during the 3-day collecting period. Parr were maintained and acclimated in 75-liter glass aquaria containing water drawn from Big Brook. Acclimation was accomplished through the elevation of water temperature 0.5 degrees every 10 h from the temperature of collection with sensitive heater-thermostats until the desired level (27.5C) was achieved. Upper lethal temperature for the highest level of acclimation (27.5C) was calculated from percentage mortality, as a function of test temperature, using probit analysis in the biomedical program (BMDO35) adapted for CDC 6400 computer. The upper lethal temperature for acclimation 27.5C was determined to be 27.80C plus or minus 0.41 for 10,000 min exposure. There was no significant correlation (P much greater than 0.05) between size and order of death. (Holoman-Battelle)
W74-04869

SURVIVAL OF BROOK TROUT IN A BOG-DERIVED ACIDITY GRADIENT,
Pennsylvania State Univ., University Park. Dept. of Biology.
W. A. Dunson, and R. R. Martin.
Ecology, Vol 54, No 6, p 1370-1376, Autumn 1973. 8 fig, 1 tab, 8 ref.

Descriptors: *Brook trout, *Resistance, *Hydrogen ion concentration, *Bioassay, On-site tests, Acid streams, Water analysis, Bogs, Acidity, Electro-fishing, Acidic water, Fishing, Freshwater fish, Water sampling, Chemical analysis, Rainfall, *Pennsylvania.
Identifiers: Survival, *Acidity gradient, *Bear Meadows Bog(Penn), White sucker, Sinking Creek, Carbonic acid, Salvelinus fontinalis, Semotilus atromaculatus, Rhinichthys atratulus, Blacknose dace, Creek chub, Catostomus commersoni, Median tolerance limit.

Bear Meadows Bog water was analyzed to determine (1) if volatile acids were present, (2) the species of fish present at various pH's in the stream, and (3) the pH tolerance of hatchery brook trout placed in the stream at points where native fish were present or absent. The acidity of the bog water (pH 3.7-4.7) is not due to carbonic acid or to any other volatile acid. The approximate pK of the unknown bog water acid(s) is 6.0-6.5. Fish do not occur in Bear Meadows Bog or in Sinking Creek (the bog's only outlet) over a 4.8-km section below the bog where water pH is too low for their survival. The lowest pH in which brook trout and white suckers were caught in Sinking Creek was 4.25 at area 5 (5.25 km below the bog) after a period of unusually heavy rainfall. At a different time brook trout alone were caught at area 4, 5.2 km below the bog, when the pH was 4.75. The lowest recorded pH at this site was 4.0. Survival times of hatchery brook trout placed in boxes in Sinking Creek were directly related to pH. Individual differences in tolerance to low pH were quite marked, especially at pH's not rapidly lethal. Whether these individual differences are of environmental or genetic origin is not known. (Holoman-Battelle)
W74-04873

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W74-04874

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

PRIMARY PRODUCTION OF THE PERIPHYTON IN THE LITTORAL OF THE DANUBE,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Lab. of Fisheries and Hydrobiology.
M. Ertl, and J. Tomajka.
Hydrobiologia, Vol 42, No 4, p 429-444, September 28, 1973. 4 fig, 2 tab, 36 ref.

Descriptors: *Periphyton, *Primary productivity, Littoral, Rivers, *Biomass, Growth rates, Cultures, *Photosynthesis, Water levels, *Chlorophyll.
Identifiers: *Danube River, Chlorophyll a, Light and dark bottle method.

The gross primary production of periphyton, grown on artificial substrata in the littoral of the Danube, was measured by the light and dark bottle method from April, 1970 to March, 1971. The periphyton used for the measurements was sampled from various depths, in order to cover the production of the whole littoral. The highest primary production was always found in the zone just below the water level. Exceptions occurred only when this zone was inundated for a short time as a result of a temporary rise of the water level and the periphyton was insufficiently developed. In order to compare the values of primary production of periphyton obtained from shallower rivers, where the whole bottom is well illuminated, or from rivers that do not exhibit such frequent and extensive level oscillations as the Danube, average value calculated from results obtained from the zone closest to the water level at the time of measurements, were always used. Primary periphytic production in the surface zone was 43.8 mg 02/sq dm/day. Efficiency of gross photosynthesis in this zone was on the average 1.72 percent. The height of the water level and the water temperature were highly correlated with gross periphytic production. Close relationships between chlorophyll a content, biomass and gross primary production of periphyton were found. (Mortland-Battelle)
W74-04876

TIDAL STREAM DEVELOPMENT AND ITS EFFECT ON THE DISTRIBUTION OF THE AMERICAN OYSTER,
Delaware Univ., Lewes. Coll. of Marine Studies.
R. Keck, D. Maurer, and L. Watling.
Hydrobiologia, Vol 42, No 4, p 369-379, September 28, 1973. 8 fig, 1 tab, 21 ref.

Descriptors: *Oysters, *Tidal streams, *Distribution patterns, *Environmental effects, Meanders, Currents(Water), Scour, Deposition(Sediments), Dredging, Erosion.
Identifiers: American oyster, Crassostrea virginica, Current velocity, Delaware Bay, Macroinvertebrates.

This research was undertaken to determine the effect of tidal stream development on the distribution of the American oyster Crassostrea virginica. Data are presented on the effect of tidal stream formation on larval setting spat development, and maintenance of a healthy adult population. The four major oyster producing rivers in the state of Delaware are: the Leipsic, Murderkill, Mispillion, and Broadkill. In the majority of rivers the oyster producing sections extend 3500-4000 yards (3150-3600 m) from the river mouths. These sections were staked off in 100 yard (90 m) intervals. An oyster dredge with an approximate one meter mouth was towed over the right, middle, and left portions of each 100 yard (90 m) section. All live oysters (larger than 2 cm in height) were counted and measured to the nearest tenth of a centimeter. The total number of oysters per haul was used to plot the density of the oyster beds, and eventually to estimate the total number of bushels for each river. Dense populations are most often found associated with large meanders. The differential current velocities associated with meander formation result in areas of scour, which are beneficial to development of oyster beds; and areas of deposition, which are detrimental to survival of oysters. (Mortland-Battelle)
W74-04878

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
O. Moestrup, and L. R. Hoffman.
Journal of Phycology, Vol 9, No 4, p 430-437, December 1973. 10 fig, 19 ref.

Descriptors: *Aquatic algae, *Chlorophyta, *Cytological studies, Electron microscopy, Plant morphology, Aquatic plants.
Identifiers: *Dichotomosiphon tuberosus, *Ultrastructure, Chloroplasts, Vaucheria, Saprolegnia, Phycomycetes, Cytoplasmic streaming, Sample preparation.

The ultrastructure of the siphonous green alga Dichotomosiphon tuberosus (A. Br.) Ernst is compared with that of other siphonous plants. There is a characteristic association between the Golgi bodies and endoplasmic reticulum, but the mitochondria are not involved in the association as they are in Vaucheria and the phycomycete Saprolegnia. An unusual structure and arrangement of the chloroplasts is described as well as a previously unreported type of 'striated tubule' which occurs in most if not all chloroplasts and amyloplasts. The structure of these tubules is compared with that of other tubules recently found in green algae and higher plants. In addition, cytoplasmic microtubules arranged in the longitudinal direction of the siphon suggest a function in cytoplasmic streaming. (Holoman-Battelle)
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
S. E. Stevens, Jr., C. O. P. Patterson, and J. Myers.
Journal of Phycology, Vol 9, No 4, p 427-430, December 1973. 1 fig, 2 tab, 7 ref.

Descriptors: *Aquatic algae, *Cyanophyta, *Kinetics, Light, Nostoc, Cultures, Inorganic compounds.
Identifiers: *Hydrogen peroxide, *Axenic cultures, Photochemistry, Biosynthesis, Culture media, Algal physiology, Photoreduction, Photoproduction.

Thirty-eight axenic isolates of blue-green algae (Cyanophyta) were surveyed for hydrogen peroxide production. In order to avoid complications due to poor growth, three different culture media were used. Cells were grown in liquid culture on the chosen medium at 35C, with continuous agitation and 1 percent CO2 in air (v/v) bubbling through the culture. 5-25 w tungsten lamps were positioned 8 cm from the growth tubes in order to enhance peroxide production. Sixteen of the isolates (type I) showed no production of H202 within the sensitivity of the assay. Type II isolates showed no H202 production while in darkness, but at onset of illumination, H202 production was observed. After a short initial induction period, the rate of peroxide production remained steady until assay ingredients were exhausted or until light was extinguished. Type III isolates produced no H202 while in darkness, but at onset of illumination, displayed peroxide production with complex kinetics. Salient features included an initial lag, followed by a burst of period of rapid production of H202; the burst graded into a lower rate which then held steady. Type IV isolates differed markedly from all other assayed in that type IV algae produced H202 in darkness. Illumination of type IV cells caused an immediate increase in rate of H202 production. This increased rate continued without variation until light off. At light off, peroxide production dropped back to a rate equal to or sometimes slighily greater than the initial rate observed prior to illumination. The three kinetic profiles observed for peroxide formation are described. The possible site or sites of hydrogen peroxide formation remain unknown. (Holoman-Battelle)
W74-04882

SPECIES OF OCEANIC DINOFLAGELLATES IN THE GENERA DISSODINIUM AND PYROCYSTIS: INTERCLONAL AND INTERSPECIFIC COMPARISONS OF THE COLOR AND PHOTON YIELD OF BIOLUMINESCENCE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W74-04883

CHLOROPHYLL, NITROGEN, AND PHOTOSYNTHETIC PATTERNS DURING GROWTH AND SENESCENCE OF TWO BLUE-GREEN ALGAE,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
R. J. Daley, and S. R. Brown.
Journal of Phycology, Vol 9, No 4, p 395-401, December 1973. 3 fig, 1 tab, 35 ref.

Descriptors: *Aging(Biological), *Chlorophyll, *Nitrogen, *Photosynthesis, *Plant growth, Plant pigments, *Cyanophyta, Aquatic algae, Instrumentation, Aquatic plants, Nitrates, Growth rates, Cultures, Electron microscopy, Light intensity, Nitrogen fixation.
Identifiers: Anacystis nidulans, Phormidium molle var. tenuior, Growth kinetics, Phycocyanin, Thylakoids, Senescence, Carotenoids, Ultrastructure, Culturing techniques, Organic nitrogen, Oxygen evolution.

A standardized, multiflask, batch culture system was developed to study the processes of algal senescence in Anacystis nidulans and Phormidium molle Gom. var. tenuior W. et G. West. Growth data over a 3-year period gave reproducible and comparable time-course curves. Although A. nidulans in unicellular and P. molle filamentous, the patterns of change with age were similar. Mean logarithmic doubling times and carbon yields were, respectively, 6.9 hr and 390 mg C/liter for A. nidulans and 7.2 hr and 710 mg C/liter for P. molle. Chlorophyll concentration and photosynthetic capacity per unit carbon rose rapidly during the logarithmic phase to maximum levels in either late log phase (P. molle) or early linear phase (A. nidulans), then fell throughout the declining growth phase to low levels in the stationary phase. Nitrate was rapidly exhausted from the medium during the period of logarithmic growth and stoichiometrically converted to particulate organic form; very little subsequent fixation of molecular nitrogen occurred. The phycocyanins were rapidly destoryed during the logarithmic phase while the carotenoids remained relatively constant throughout the whole growth period and then slowly declines. Preliminary electron micrographs showed a progressive deterioration in cellular ultrastructure, especially a reduction in the number of photosynthetic thylakoids, commencing in the linear growth phase. Analysis of the results suggests that occurrence of linear growth kinetics and termination of culture growth were caused by exhaustion of nitrate. The observed decreases in chlorophylls, phycocyanins, and photosynthetic capacity during active culture growth show that senescence effects may not be, as assumed, restricted to the stationary phase of growth. (Holoman-Battelle)
W74-04884

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
For primary bibliographic entry see Field 5A.
W74-04888

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
For primary bibliographic entry see Field 5A.
W74-04891

EFFECT OF HELIUM GAS AT ELEVATED PRESSURE ON IRON TRANSPORT AND GROWTH OF ESCHERICHIA COLI,
Naval Medical Research Inst., Bethesda, Md.
N. A. Schlamm, J. E. Perry, and J. R. Wild.
Journal of Bacteriology, Vol 117, No 1, p 170-174, January 1974. 1 fig, 4 tab, 14 ref.

Descriptors: *E. coli, *Helium, *Environmental effects, *High pressure, *Iron, Growth rates, Hydrostatic pressure, *Bacteria.
Identifiers: 2 3-Dihydroxybenzoylserine, Culture media, 2 3-Dihydroxybenzoic acid, Ferric sulfate, EDTA.

Helium at an ambient pressure of 68 atm with 0.2 atm of O2 shortened by 1 to 1.5 h the lag phase for growth of Escherichia coli in minimal medium supplemented with 2 microliters of cell-free culture filtrate (CFF) per ml or with 1 microM 2,3-dihydroxybenzoylserine (DHBS), an iron chelator. The lag phase of cultures not exposed to helium could be shortened by use of supplements, but higher concentrations were required - 10 to 30 microliters of CFF per ml or 10 to 50 microM DHBS. Strain AN 193 of E. coli, which requires the DHBS precursor 2,3-dihydroxybenzoic acid (DHBA), grew well in media with 10 microM DHBA when exposed to helium at 68 atm, whereas 100 microM DHBA was required for growth in unexposed cultures. In the presence of 100 microM DHBA plus 1.0 microM ethylenediaminetetraacetic acid, growth was inhibited at 1 and 68 atm. Growth was restored, however, by the addition of 0.1 microM FeSO4 at 68 atm and 1.0 microM FeSO4 at 1 atm, but lag times were invariably shorter in the pressurized cultures. Hydrostatic pressures of 68 atm did not reduce the lag phase in the presence of CFF, DHBS, or DHBA. Results suggest that 68 atm of helium pressure, but not hydrostatic pressure, elicited a more rapid transport of iron into the cells. (Holoman-Battelle)
W74-04897

BIOLOGICAL RESPONSE TO DETERGENT AND NONDETERGENT PHOSPHORUS IN SEWAGE - PART I,
Utah Water Research Lab., Logan.
D. B. Porcella, P. A. Cowan, and E. J. Middlebrooks.
Water and Sewage Works, Vol 120, No 11, p 50-67, November 1973. 2 fig, 3 tab, 6 ref.

Descriptors: *Algae, *Detergents, *Growth rates, *Limiting factors, *Phosphorus, *Waste treatment, Bioassay, Chemical analysis, Domestic wastes, Nutrients, Water pollution effects, Nitrogen, Iron, Trace elements, Phosphates, Water pollution sources, Water treatment, Water pollution control.
Identifiers: Selenastrum capricornutum, Anabaena flos-aquae.

Sewage effluent from a suburban community of the City of Logan, Utah, was collected during times when detergents were and were not used to ascertain whether the elimination of phosphate detergents would affect algal growth. Algal bioassays were conducted with Selenastrum capricornutum and Anabaena flos-aquae using nutrient spikes to determine which nutrients were limiting. Bioassays were also performed using secondary treated, detergent-free sewage samples spiked with detergent to observe whether any increase in biostimulation resulted. The nutrient spikes were NH4Cl, KH2PO4, Fe and trace elements, and NAAM solution for control. Chemical analysis of the sewage samples showed that restricted use of detergent resulted in a 57 percent decrease in phosphorus content; alum treatment also reduced phosphorus content. However, calculated phosphorus concentrations in the bioassay flasks

for different dilutions of the secondary and tertiary effluents of the two sewage samples indicated the P content was high as a result of the high level of P in the reservoir water used for dilution. It is concluded that if the P content of the water is naturally high, the addition of more P will not affect algal growth. The results of the algal bioassays are not included. (Little-Battelle)
W74-04901

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
Journal of Phycology, Vol 9, No 4, p 383-394, December 1973. 10 fig, 3 tab, 74 ref.

Descriptors: *Anabaena, *Deficient elements, *Phosphorus, *Cytological studies, Plant physiology, *Assay, Cyanophyta, Plant growth, Bioindicators, Aquatic algae, Temperature, Hydrogen ion concentration, Light, Phosphates, Absorption, Carbohydrates, Bioassay, Nutrient requirements.
Identifiers: *Enzyme activity, Heterocysts, Alkaline phosphatase, Culture media, Substrate concentration, Chlorophyll a, Anabaena variabilis, Ribonucleic acid, Substrate utilization.

Several aspects of the metabolism and composition of a strain of Anabaena have been studied during phosphorus deficiency. The effects of medium composition, substrate concentration, temperature, pH, and illumination on alkaline phosphatase activity and phosphate uptake have been examined. Of particular interest among these results was the dependence of maximum alkaline phosphatase activity on Ca and of phosphate uptake on Mg. Depletion of dissolved phosphate from the culture medium was accompanied by a marked increase in alkaline phosphatase activity, initial rate of phosphate uptake, and total amount of phosphate taken up to satisfaction of the phosphorus debt. Readdition of phosphate to a phosphorus-deficient culture resulted in a rapid decline in the ability to take up phosphate but no loss of alkaline phosphatase beyond dilution of activity already present. Entry into phosphorus deficiency was accompanied by a loss of heterocysts, a decline in chlorophyll a, protein, RNA, and cellular phosphorus, and an increase in carbohydrate per unit dry weight. The possible use of these changes as physiological indicators of phosphorus limitation in natural situations is discussed. (Holoman-Battelle)
W74-04905

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
R. Geldiay, and I. U. Tareen.
Scientific Reports of the Faculty of Science No 137, 1972. 15 p, 5 fig, 2 tab, 9 ref.

Descriptors: *Diptera, *Oligochaetes, *Midges, *Benthic fauna, Eutrophication, Sands, Domestic wastes, Spatial distribution, Seasonal, Habitats, Oxygen, Hydrogen sulfide, Temporal distribution, Organic matter, Nematodes.
Identifiers: *Golcuk Lake(Turkey), Chironomus tentans, Chironomus plumosus, Chaoborus crystallinus, Tubifex tubifex, Chironomux anthracinus, Chaetogaster limnaei, Nais, Lumbriculus, Aelosoma, Stylaria fossularis, Enchytraeus, Ophidonais.

The study of bottom fauna, particularly Chironomid larvae, Chaoborus larvae, and Oligochaeta in Golcuk, a eutrophic mountain lake in western Turkey, emphasized their habitat preference for regions rich in organic matter and their depth distribution in different months. The lake, situated 20 km from the town of Odemis, is alkaline with mean pH value 7.3. Samples were taken for qualititative and quantitative analysis at three stations. In Station 2 population and seasonal variation studies were carried out. The sparse occurrence of the organisms was attributed to the sandy bottom. Where urban drainage from the village of Golcuk takes place, the bottom, characterized by organic mud, was the most productive region of the lake. Tubifex tubifex and Chironomus tentans were abundant and functioned as sewage indicators. The organisms are listed. Station 3, being purely sandy, was poorest in density composition. There was a considerable number of bottom fauna in the littoral which contained dense vegetation. Maximum bottom fauna were found in April. In September, during stratification, oxygen depletion and implementation of hydrogen sulfide caused a decline in total bottom fauna, but Oligochaeta and Chironomus tentans were resistant to hydrogen sulfide toxicity. Chaoborus larvae were most abundant in winter. (Jones-Wisconsin)
W74-05044

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. R. Cain, and F. R. Trainor.
Phycologia, Vol 12, No 3/4, p 227-232, 1973. 1 fig, 4 tab, 8 ref.

Descriptors: *Analytical techniques, *Bioassay, *Algae, Nutrients, Laboratory tests, Monitoring, Connecticut, Growth rates.
Identifiers: *Algal assay, Selenastrum capricornutum, Continuous cultures, Willimantic River(Conn), Natchaug River(Conn), Shetucket River(Conn).

Laboratory procedures are suggested for a quick, reliable, and uncomplicated measurement of the amount of algal growth a body of water can support (its carrying capacity). Selenastrum capricornutum was used as the test organism for assaying nutrient condition of waters. Using an actively growing culture, inoculated, sterile-filtered water was incubated at 22C in continuous fluorescent illumination. Organisms were grown in tubes on a roller tube rotator, and transferred daily, reestablishing a population of 400,000 cells each day. Averages of 5-day runs showed no evidence of nutrient carry-over when 1 + doublings per day were recorded; carryover usually was not apparent on days 3-5 when nutrient poor waters were examined. Samples were collected near the Willimantic, Connecticut sewage treatment plant at the confluence of Willimantic and Natchaug Rivers. Upstream the Willimantic River receives the discharge from several industries. Downstream from the treatment plant, the Shetucket River was also sampled. This study shows that growth rate of a defined population in a daily transferred culture may be used to measure the ability of surface waters to support algal growth. The procedure suggested meets the basic requirements of simplicity, speed, reproducibility, and applicability to field conditions. (Jones-Wisconsin)
W74-05045

FACTORS AFFECTING THE PHOTOSYNTHETIC CAPACITY OF LABORATORY CULTURES OF THE DIATOM PHAEODACTYLUM TRICORNUTUM,
La Trobe Univ., Bundoora(Australia). Dept. of Botany.
D. J. Griffiths.
Marine Biology, Vol 21, No 2, p 91-97, 1973. 4 fig, 1 tab, 3 ref.

Descriptors: *Photosynthesis, *Biochemistry, *Diatoms, Laboratory tests, Temperature, Chlorophyll, Enzymes, Light intensity, Plant growth.
Identifiers: Phaeodactylum tricornutum.

The relative importance of the two photosynthetic components, enzymatic reactions and light reactions, in controlling the photosynthetic capacity of laboratory cultures of Phaeodactylum tricornutum exposed to a variety of conditions is investigated, and, in a preliminary way, the possible mechanisms involved are explored. The light-saturated photosynthetic capacity of batch cultures of P. tri-cornutum grown in a regime of 16 h light and 8 h dark, reaches a maximum two days before the end of the exponential growth phase and declines thereafter. The fall-off of photosynthetic capacity is more rapid at a higher light intensity. Cultures exposed to a prolonged period of darkness maintain a high photosynthetic capacity. It is possible to reversibly reduce the photosynthetic capacity to a very low level, without significantly affecting the chlorophyll-a concentration by carefully controlling the conditions of dark incubation. Evidence from estimations of chlorophyll-a, total protein, and of the gross pattern of photosynthetic assimilation under different gread of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a subsurface counter current is postulated. (Jones-Wisconsin)
W74-05046

AN EXPERIMENTAL INVESTIGATION INTO EFFECTS OF PULP MILL EFFLUENT ON STRUCTURE OF BIOLOGICAL COMMUNITIES IN ALBERNI INLET, BRITISH COLUMBIA. PART 1: SUBTIDAL COMMUNITIES,
British Columbia Univ., Vancouver. Dept. of Zoology.
J. R. E. Harger, M. L. Campbell, R. Ellison, W. P. Lock, and W. Zwarych.
International Journal of Environmental Studies, Vol 4, No 4, p 269-282, 1973. 24 fig, 1 tab, 35 ref.

Descriptors: *Pulp wastes, *Estuaries, *Biological communities, Canada, Phytoplankton, Intertidal areas, Water pollution effects, Oxygen, Light intensity, Salmon, Light penetration.
Identifiers: *Alberni Inlet(British Columbia), Species diversity.

During the summer of 1971 an investigation into effects on biological communities of effluents discharged from a Kraft paper mill into Alberni Inlet on the west coast of Vancouver Island, British Columbia, was undertaken. The problem of separating effects of fresh water influence on developing communities from those attributable to pulp mill effluent was solved partly by setting a series of roughened formica test panels at a depth of 20 ft throughout the length of the inlet in order that settlement of sessile organisms could be recorded. These plates were also extended into a control area. Structure of communities developing on test panels was investigated using four analytical techniques. This structure indicated simplification, as measured by a number of indices relating to species diversity, and was associated with water transparency as well as other physical factors relating to effluent discharge. A dynamic interaction between influence of dark colored mill effluent in reducing phytoplanktonic production at the head of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a sub-surface counter current is postulated. (Jones-Wisconsin)
W74-05047

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
J. S. Mattice.
Ekologia Polska, Vol 20, No 39, p 525-539, 1972. 3 fig, 4 tab, 19 ref.

Descriptors: *Productivity, *Aquatic populations, *Snails, *Biomass, Life cycles, New York, Freshwater, Mortality, Standing crops.
Identifiers: *Bithynia tentaculata, Oneida Lake(N.Y.).

Productivity of a natural population of Bithynia tentaculata, a prosobranch gastropod mollusk, in eutrophic Oneida Lake, New York was estimated from standing crop biomass and mortality. It is a relatively recent immigrant to North America and is replacing the Pleurocerid in this climate. Biomass was estimated using two basic units: tissue dry weight and total organic carbon. Regular growth samples revealed that Bithynia lives for 17 to 18 months and shows a typical growth curve for a freshwater snail in a harsh temperate environment. Field density counts were combined with analyses of total organic carbon of snails at selected times of the year to yield assessments of population biomass. Mortality data, obtained from comparative density measurements and collections of empty shells made possible the estimate of carbon lost from the population over a 12 month period. The sum of the difference between the standing crop biomass in June of two consecutive years and the carbon lost to mortality in the interim gave a value for productivity of the population of 511 mg/C/sq m/year. (Jones-Wisconsin)
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
K. Prejs, and A. Stanczykowska.
Ekologia Polska, Vol 20, No 45, p 733-745, 1972. 7 fig, 3 tab, 12 ref.

Descriptors: *Benthic fauna, *Lakes, *Spatial distribution, Temporal distribution, Microorganisms, Nematodes, Oligochaetes, Copepods, Crustaceans, Diptera, Dominant organisms, Littoral, Profundal zone.
Identifiers: *Mikolajskie Lake(Poland), Sniardwy Lake(Poland), Taltowisko Lake(Poland), Ostracoda, Tardigrada.

In a 6-year study of zoomicrobenthos of three Polish Masurian lakes, differences were recorded in samples between stations at the same depth, composition, and numerical dynamics in number and qualitative composition. Lake Mikolajskie is eutrophic, holomictic; Lake Sniardwy, eutrophic, polymictic; and Lake Taltowisko, mezotrophic, holomictic. The zoomicrobenthos groups distinguished were Nematoda, Oligochaeta, Copepoda, Cladocera, Ostracoda, Chironomidae, and Tardigrada. Differences in numbers were not great and were independent of density and qualitative composition. From littoral to profundal, the highest number was in the littoral, lowest in the sublittoral; a similar distribution of systematic groups in all profiles, constant domination of Nematoda in shallow parts and a decrease in their number with increasing depth, were found. Determination of changes in zoomicrobenthos number and composition during the 6 years at the same stations in the profundal zone showed that the polymictic Lake Sniardwy has a relatively constant number but domination of particular animal groups varies. Holomictic Mikolajskie Lake displays changes in number with a growth tendency in the last years but with a relatively constant domination of one group. (Jones-Wisconsin)
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
W. A. Godlewska-Lipowa, and I. Jablonska.
Ekologia Polska, Vol 20, No 28, p 367-371, 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Bacteria, *Lakes, *Spatial distribution, Sewage effluents, Microbiology.
Identifiers: *Mikolajskie Lake(Poland).

Water samples were taken in 12 places along the main axis of Mikolajskie Lake, Poland some distance from shore in the vicinity of municipal sewage flow and at the connection with lakes Sniardwy and Beldany. Samples were taken from surface to bottom every 2-5 m at each site. Filtered samples were analyzed to calculate total number of dominant bacteria, that is, cocciforms, rodforms bacilla. The differences found between particular samples, and even particular filters, were relatively small. Bacteria numbers ranged within 4900-7900 thousands/ml of water on the lake surface and 4000-10,000 thousands/ml at other depths at the various stations. Greater abundance of bacteria was observed close to the municipal sewage inflows and at the connection with lakes Sniardwy and Beldany. Great bacterial abundance was found at the depths of 5 and 10 m, on a site possibly near sewage inflow. A considerable preponderance of cocci forms over the bacilliforms and rod-forms indicated that the organic substance flowing into the lake is easily assimilated and becomes quickly mineralized. There was a small percentage of positive Gram bacteria of bacilliform, ranging from 1-3% to 14%. (Jones-Wisconsin)
W74-05051

ASCORBIC ACID AND HETEROCYST DEVELOPMENT IN THE BLUE-GREEN ALGA ANABAENA AMBIGUA,
Banaras Hindu Univ., Varanasi (India). Lab. of Algal Physiology.
C. K. Wahal, N. C. Bhattacharya, and F. R. S. Talpasayi.
Physiologia Plantarum, Vol 28, No 3, p 424-429, 1973. 6 fig, 21 ref.

Descriptors: *Cytological studies, *Anabaena, *Organic acids, Nitrogen, Enzymes, Metabolism.
Identifiers: *Ascorbic acid, *Heterocyst production, Anabaena ambigua.

The role of ascorbic acid in heterocyst development is examined in a strain of Anabaena ambigua. It was cultivated with combined nitrogen and with molecular nitrogen. The amount of different forms of ascorbic acid found in the alga grown with and without combined nitrogen is given. The L-ascorbic acid content of the alga containing heterocysts was always higher than that present in the alga lacking the heterocysts, whether the alga was exposed to light or kept in darkness. The ratio of heterocysts to vegetative cells increased considerably under the influence of ascorbic acid. Thus it appeared that the effect of iso-L-ascorbic acid was about the same as that of L-ascorbic acid. Exogenously added ascorbic acid, up to 0.5 mg/ml, increased the heterocyst frequency to nearly three times that of the control. D-isoascorbic acid, an analogue of ascorbic acid, also showed an enhancement of heterocyst production. The exact location of the enzyme in the alga is not known although the heterocysts were earlier shown to contain ascorbic acid. Cytochemical tests, however, indicated strong peroxidase activity in the heterocysts. (Jones-Wisconsin)
W74-05052

SYNCHRONOUS CULTURES OF CHLAMYDOMONAS REINHARDTI: PROPERTIES AND REGULATION OF REPRESSIBLE PHOSPHATASES,
Bergen Univ., Norway. Botanical Laboratory.
T. Lien, and G. Knutsen.
Physiologia Plantarum, Vol 28, No 2, p 291-298, 1973. 11 fig, 20 ref.

Descriptors: *Cytological studies, *Chlamydomonas, *Enzymes, Phosphates, Phosphorus, Proteins, Synthesis.
Identifiers: *Repressible phosphatases, Derepression.

In synchronously growing Chlamydomonas cells, phosphatase activities in -P and +P medium, de novo synthesis (derepression) of phosphatase in cells grown in -P medium, variation in TCA soluble inorganic and organic phosphate during phosphatase derepression, and effect of orthophosphate and cycloheximide on derepression of phosphatase are reported. A double labelling isotope technique coupled with cellulose acetate electrophoresis were used. Repressed and derepressed phosphatase exhibited different enzymatic properties. Especially the acid phosphatase was located near the cell surface. Inorganic, cold TCA-extractable P-32, decreased during the first 1-2 h after phosphate deprivation when there was little or no net synthesis of phosphatase. Results of experiments with additions of orthophosphate and cycloheximide to derepressed cells, indicated that the derepressible enzyme was relatively unstable, while its m-RNA was relatively stable. Of ecological significance is the attachment of the enzyme to the cell surface, and the excretion of enzyme during sporulation. This may enable cells in growth media with low orthophosphate contents to hydrolyze extracellular phosphate esters and consequently increase the amount of available orthophosphate. This mechanism is made more efficient by the increased substrate affinity of the derepressed enzyme. (Jones-Wisconsin)
W74-05053

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
T. Larsson.
In: Proceedings from A Nordic Symposium, October 25-26, 1972, Oslo, Norway, p 59-61.

Descriptors: *Analytical techniques, *Algae, *Fluorometry, *Bioassay, Biomass, Monitoring, Cultures, Chlorophyll, Nutrients, Trace elements, Phosphates, Chelation.

The effects of trace elements, a chelating agent, and phosphate on algal growth were studied in two factorial experiments. Scenedesmus quadricauda and Raphidonema spiculiforme were cultivated in media, whose concentrations of the above substances were varied simultaneously. Growth was measured by fluorimetric determinations of in vivo chlorophyll and sometimes also by microscopic cell count. Highly significant correlations were found between these two methods of biomass monitoring. Results of the experiments show that fluorimetric measurement of in vivo chlorophyll is a useful method for assessing growth in algal experiments. From the analysis of variance, and due to problems of using chlorophyll concentration to assess biomass, fluorimetric measurements of algal growth should be controlled by a method which measures biomass more accurately, for instance by analysis of cell carbon or cell counting with an electronic particle counter. It is thus important to measure biomass with one of these methods at a time when the analytical results will give much information concerning the objectives of the experiment. Such a time can be chosen with the guidance of fluorimetric determination of in vivo chlorophyll. (Jones-Wisconsin)
W74-05055

FIELD EXPERIMENT ON THE FACTORS CONTROLLING PRIMARY PRODUCTION OF THE LAKE PLANKTON AND PERIPHYTON,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
A. Hillbricht-Ilkowska, A. Kowalczewski, and I. Spodniewska.
Ekologia Polska, Vol 20, No 25, p 315-326, 1972. 7 fig, 1 tab, 10 ref.

Descriptors: *Primary productivity, *Lakes, *Plankton, Periphyton, Photosynthesis, Algae,

Spatial distribution, Light penetration, Eutrophication, Chlorophyll, Diatoms.
Identifiers: Mikolajskie Lake(Poland), Phaeophytin.

Two experiments with plankton and one with periphyton in Mikolajskie Lake of the Masurian Lakeland were conducted to distinguish the influence of light on algae production at various depths. Plankton was sampled at 8 different depths; periphyton from Potamogeton perfoliatus leaves at 5 depths. Primary productivity was estimated by the light-dark bottle technique. Oxygen, chlorophyll, and phaeophytin were determined; total biomass and dominant species estimated. Diatoms were dominant in plankton and many small forms were found during the spring experiment. Algal biomass was then about 5.0 mg/l, and vertical distribution of algae from 0 to 15 m of depth was relatively uniform. Dominance of dinoflagellates was observed during the summer experiment with plankton. Visible concentrations of dinoflagellates capable of active movements were found in the layers 1-2 m and 6-8 m. In both plankton experiments there were no basic differences in species composition of algae at particular depths. Plankton collected from all depths during the spring experiment, including the samples from 10 and 15 m, showed similar production values at all suspension depths. Results suggest varying photosynthetic algal activities from different depths. Highest photosynthetic activity in the summer plankton was found at depths of 3 and 5 m. (Jones-Wisconsin)
W74-05056

PROBLEMS OF THE CONSERVATION OF FRESHWATER ECOSYSTEMS,
Nature Conservancy, Edinburgh (Scotland).
N. C. Morgan.
In: 'Conservation and Productivity of Natural Waters,' Symposia of the Zoological Society of London, No. 29, p 135-154. Academic Press, London, 1972.

Descriptors: *Water conservation, *Preservation, *Natural resources, Management, Europe, Wetlands, Protection, Reservoirs, Water policy, Aquatic life, Estuaries, Wildlife, Recreation, Water pollution effects, Agriculture, Forestry, Insecticides, Herbicides, Farm wastes, Aesthetics, Aquatic plants, Systematics.
Identifiers: *Nature Conservancy(Scotland), United Kingdom, Chalk aquifers.

The discussion centers on the major problems in the United Kingdom and some of the steps taken by the Nature Conservancy and other organizations in conserving freshwaters with the intention of maintaining their scientific interest or rehabilitating their physical, chemical, or biological quality. With the objective to select a series of high quality sites as National Nature Reserves to represent the range of variation of this habitat, reference is made to the problems of water abstraction and storage reservoirs with their varying water levels resulting from specific usage. The effects of irrigation and abstraction of water from chalk aquifers and their effects on river flow, and increasing pressures to use open water for recreation and the consequent effects on conservation of habitat and wildlife particularly near large cities are discussed as well as domestic pollution and the effects of various agricultural practices, particularly in relation to nutrient levels in drainage water. The decline of aquatic vegetation in some water bodies is recorded and possible causes mentioned. The extensive use of herbicides for clearing drainage ditches and the side effects on other components of the ecosystem are considered. (Auen-Wisconsin)
W74-05057

BIOENERGETICS OF THE ASSIMILATING CELLS OF CHLORELLA PYRENOIDOSA CHICK. II. RELATION OF CYCLIC AND NON-CYCLIC PHOTOPHOSPHORYLATION TO PHOTOSYNTHETIC CO2 FIXATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
T. A. Glagoleva, M. V. Chulanovskaya, and O. V. Zalenskii.
Photosynthetica, Vol 6, No 4, p 354-363, 1972. 3 fig, 2 tab, 34 ref.

Descriptors: *Chlorella, *Biochemistry, *Photosynthesis, Cycles, Cytological studies, Light, Carbon cycle.
Identifiers: *Photophosphorylation, Calvin cycle.

Regular changes of relative rates of cyclic and non-cyclic photophosphorylation were investigated and compared with rates of photosynthetic carbon dioxide fixation and oxygen evolution under varying irradiance and temperature. Rate of photoassimilation of glucose was determined by counting the radioactivity of Chlorella pyrenoidosa cells starved of carbohydrates. Rate of starch biosynthesis was estimated by C-14 incorporation. At 670 nm rate of carbon dioxide fixation was 3 times greater at 38C than at 10C and the incorporation of C-14 into starch 2.8 times. Incorporation of C-14 into starch at 714 nm depends on temperature only between 10-20C. From these tests, the relative contribution of cyclic photophosphorylation in the processes immediately unrelated to the Calvin cycle can be estimated. These data testify that interrelations of energy sources in uptake of substances and ions and in the biosynthesis of macromolecules (polysaccharides and proteins) vary under different experimental conditions. Upon increase in rate of photosynthetic gas exchange, relative contribution of non-cyclic photophosphorylation to the realization of these processes also increases and under a certain set of conditions can amount to half of the 'summary' rate of photophosphorylation. (Jones-Wisconsin)
W74-05059

AERATION SYSTEM REVITALIZES LAKES.
Civil Engineering, American Society of Civil Engineers, May 1971. p 107. 1 fig.

Descriptors: *Aeration, *Lakes, *Rehabilitation, Oxygenation, Destratification, Ohio, Illinois, Michigan, Algal control, Freezing, Waste water treatment, Technology.
Identifiers: *Air Aqua systems.

If enough wastes are dumped into a lake, there comes a point when oxygen consumption of wastes and decaying algae is greater than oxygen introduced from air and by living algae. Then even natural exchanges of water strata cannot provide adequate oxygen. During the past decade, several decaying lakes in the Midwest have been restored to healthy conditions through use of the 'Air-Aqua' aeration system which introduces air to the lake bottom. This system overcomes eutrophication by artificially inducing vertical circulation of lake water and thus increasing the oxygen content of the bottom water layer. The small size of the bubbles is the key to the system as tiny bubbles dissolve oxygen more quickly into the bottom water than would those of large diameter. Not only does a large turnover of water occur in a short time, but no turbulence is created thus no sediment is brought to the surface. Three applications of the system in Ohio, Illinois, and Michigan are given, illustrating its ability to restore decaying lakes to balanced ecosystems in which fish and water fowl can thrive. (Jones-Wisconsin)
W74-05060

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
W. Abbott.
Advances in Water Pollution Research, Vol 4, No II-3240, p 729-739, 1970. 2 fig, 5 tab, 27 ref. FWPCA Grant WP-01030-01.

Descriptors: *Eutrophication, *Phosphorus, *Cycling nutrients, Phosphorus compounds, Nitrates, Productivity, Photosynthesis, Respiration, Ecosystems, Chlorophyll, On-site laboratories.
Identifiers: *Orthophosphate, Total phosphate.

It was established on a pseudokinetic, long-term basis that some experimental systems assimilated exogenous dissolved orthophosphate according to a first-order, presumptively sorption-limited, reaction scheme. Further, photosynthetic production and community respiration were correlated with nitrate and phosphate fertilization. Relevant field studies are reported. Three forms of phosphorus were defined: dissolved, labile, and bound. Analyses were carried out for orthophosphate or total phosphate on each phosphorus fraction. Of nitrogen forms, only nitrate was monitored. Eighteen experimental ponds were constructed by capturing a small bayou channel and fertilized. Trends evident by passage of P-32 through the pond environment suggest a steady-state ecological phosphorus processing machine. Differences between fertilized and control ponds indicate that a demand system probably controls allocations to various ecosystem sub-units. From this standpoint, at least relative to phosphorus, an estuary is not a 'nutrient trap' but is, rather, a 'nutrient buffer' tending to modulate phosphorus flow through the ecosystem while obviating wild fluctuations in the phosphorus economy. Sediments, in this context, are the phosphorus stockpile. Periodically, turbulence effects cycle part of this stored reserve. Metabolic demands within the community may withdraw any required phosphorus from the flux and the excess is soon returned to the stockpile. (Jones-Wisconsin)
W74-05061

TROPHIC RELATIONS OF AQUATIC INSECTS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Annual Review of Entomology, Vol 18, p 183-206, 1973. 6 fig, 3 tab, 72 ref.

Descriptors: *Animal behavior, *Trophic level, *Aquatic insects, *Food habits, Nutrients, Respiration, Food chains, Energy budget, Cycling nutrients, Systematics, Freshwater, Digestion, Diptera.
Identifiers: Hemiptera, Tanypodinae, Orthocladinae, Diamesinae.

Successful rehabilitative or management strategy of freshwater ecosystems must rely on knowledge of their structure and function. A basic facet is material cycling and energy flow. Significant portion of such cycling and flow involves processing of various forms of organic matter by freshwater invertebrate animals, especially insects, substantiating the interest in aquatic insect trophic relations-food intake, tissue assimilation, and waste release. Nutritional requirements of aquatic insects may be broadly classed as two somewhat distinct problems: intake of adequate calories to meet immediate energy costs and to accumulate energy stores; and sufficient procurement of protein to sustain adequate growth. Differences within a single species are reported. Discrepancies in food habits of the net-spinning caddis larva, Hydropsyche betteni, are described. In addition to trophic differences between two populations of the same species from different locations, age-specific variations within the same population are indicated. In general, Tanypodinae are predaceous, Orthocladinae are detrital-algal feeders, Diamesinae are algal feeders, and Chironomidae are algal-detrital feeders with some leaf mining and predaceous species. The contention is supported that most aquatic insects are best termed polyphagous or generalists and that availability, usually delineated by food particle size and texture, is the key to trophic relationships among aquatic insects. (Jones-Wisconsin)
W74-05062

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5G.
W74-05064

PHOTOSYNTHETIC RATES IN RELATION TO NITROGEN RECYCLING AS AN ADAPTATION TO NUTRIENT DEFICIENCY IN PEAT BOG PLANTS,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
E. Small.
Canadian Journal of Botany, Vol 50, No 11, p 2227-2233, 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Cycling nutrients, *Nitrogen, *Bogs, *Plants, Deficient elements, Peat, Absorption, Phosphorus, Potassium, Leaves, Photosynthesis.
Identifiers: Ottawa(Canada), Evergreen plants, Deciduous plants.

Bog evergreens may primarily represent a mechanism to retain and use nutrients. Perennial leaf duration, high reabsorption of nutrients before leaf fall, and high rates of photosynthesis contribute to maximum use of an acquired unit of nutrient element. Efficiency of the interaction of these three factors in evergreens as contrasted with deciduous species, and in bog species as compared with species of other habitats, is examined. Fifteen species in a raised sphagnum peat bog were compared with 13 non-bog species with respect to light-saturated net photosynthetic rate, and content of N, P, and K within foliage and leaf litter. Bog species reabsorb a greater proportion of the nitrogen from their leaves preceding leaf fall, than do non-bog deciduous species. When bog deciduous species are compared with non-bog deciduous species, they are potentially capable of manufacturing an average of about 60% more photosynthate for an acquired unit of nitrogen. Bog evergreens can potentially manufacture an average of about 235% more photosynthate per acquired unit of nitrogen than can bog deciduous species. (Jones-Wisconsin)
W74-05065

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, and J. C. Roth.
Publication No. 17, 1973. 108 p, 15 fig, 35 tab, 143 ref, 1 append.

Descriptors: *Limnology, *Great Lakes, *Biological communities, *Biological properties, *Physicochemical properties, Lake Michigan, Lake Superior, Lake Huron, Lake Erie, Analytical techniques, Water temperature, Light penetration, Dissolved oxygen, Alkalinity, Ions, Nutrients, Chlorophyll, Photosynthesis, Phytoplankton, Benthos, Zooplankton, Systematics, Bottom sediments.

Extensive physical, chemical, and biological information was gathered with uniform methods from 87 stations in Lakes Michigan, Superior, Huron and Erie in the summer of 1970. Data include temperature, transparency, dissolved gasses pH, alkalinity, major ions, nutrients, chlorophyll, carbon fixation by phytoplankton, zooplankton, and benthos. On the basis of limnological characteristics, the lakes are divided into ten distinct geographical zones and data on some of the parameters are compared for the ten zones. Temperature regimes vary greatly due to latitude, depth, and sampling time. In the central basin of Lake Erie, the mean surface temperature was compared with the mean concentration of dissolved oxygen. Calcium and alkalinity values are largely controlled by mineralogical characteristics of the drainage basins, whereas inputs of sulfate and chloride are largely urbanization and industrialization products. Absolute levels of silica and nitrate nitrogen in Lake Huron are controlled largely by nutrient concentrations in inputs from Lakes Michigan and Superior. Depletion of silica and nitrate in the epilimnion increases with increasing eutrophication. The lakes ranking in order of most oligotrophic to most eutrophic are Superior, Huron, Michigan, and Erie, with Saginaw Bay being as eutrophic as parts of Lake Erie. (Jones-Wisconsin)
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
Academia Publishing House of the Czechoslovak Academy of Sciences, Prague. 1973. 348 p, 154 fig, 62 tab, 322 ref.

Descriptors: *Hydrobiology, *Limnology, *Hydrology, *Chemical properties, *Physical properties, *Biological communities, Primary productivity, Plankton, Benthos, Model studies, Stratification, Hydrodynamics.
Identifiers: *Vltava Cascade(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vrane Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Sazava River(Czechoslovakia).

Results of 10-year systematic observations of the limnology of riverine Slapy Reservoir and the Vltava Cascade consisting of a chain of three main reservoirs and four re-regulation reservoirs in Czechoslovakia are discussed. Critical periods enabling determination of underlying cause and effect relationships were revealed and the complex reservoir hydrodynamics are evaluated. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is calculated. The changes that occurred in the Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, are indicated. Also discussed are the phytoplankton species and their activity and how benthic observations on Slapy Reservoir showed wide differences in organic matter supply and the cessation of this supply after upstream Orlik Reservoir became operative. Fish feeding activity in the littoral, sublittoral and the profundal zones was studied. Investigation results are reported of two re-regulation reservoirs with short retention times and differing inflowing waters. Primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton are indicated and whether the chemical or bacteriological composition of water is changed after passage through a reservoir with short retention time, and if some features characteristic of static waters develop. (See W74-05069 thru W74-05074) (Jones-Wisconsin)
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, J. Hrbacek, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 7-82. 36 fig, 5 tab, 81 ref.

Descriptors: *Reservoirs, *Thermal stratification, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Seasonal, Temperature, Heat budget, Mathematical studies, Hydrology, Water flow, Air temperature, Light penetration, Chemical stratification, Hydrodynamics.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

How basic physical and chemical limnology changes when a primarily isolated high discharge-volume riverine reservoir becomes a lower part of a cascade, and the effect of an upstream reservoir on stratification and horizontal distribution of basic physical and chemical values of the original reservoir (Slapy) in the Vltava Cascade were studied. As derived from direct comparison of two medium discharge years, the shift in time of temperature maxima of the outflowing river is doubled and there is a twofold winter temperature increase in the post-Orlik period. A similar shift of surface seasonal maxima and increase of winter temperatures was observed. Stratification was more pronounced and epilimnium thicker in the post-Orlik years. The S-shaped dissolved oxygen, pH, and alkalinity depth curves resulting from layering of the inflow to intermediate depth changed to regular curves when deep cold water of Orlik fed Slapy. During the years when Orlik was operating the minimum heat content and minimum surface temperatures were linearly positively dependent on the minimum monthly mean air temperature, which in turn is a positive logarithmic function of winter discharges. The complex hydrodynamics of reservoirs is discussed. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is obtained. (See also W74-05068) (Jones-Wisconsin)
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
L. Prochazkova, V. Straskrabova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 83-154. 35 fig, 15 tab, 66 ref.

Descriptors: *Chemical properties, *Bacteria, *Reservoirs, Eutrophication, Phosphorus, Ammonia, Nitrogen, Chemical oxygen demand, Biochemical oxygen demand, Biomass, Organic matter, Primary productivity, Coliforms, Decomposing organic matter, Discharge(Water), Conductivity, Alkalinity, Chlorides.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava River(Bohemia).

Changes that occurred in Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, Czechoslovakia were evaluated together with other external and internal factors on long-term changes in chemical and bacteriological characteristics of the reservoir surface. Nitrate concentration increased steadily with increased nitrogen fertilization in the river drainage area. About 25% of the total nitrogen supplied in fertilizers and atmospheric precipitation entered the reservoir; increase of phosphorus fertilizers had no effect on the total phosphorus in the reservoir. A significant indirect correlation of primary production with ammonia-nitrate concentration was observed. An indirect correlation was found between primary production and phosphate-phosphorus concentration. The N/P ratio increased after the construction of Orlik Reservoir to about 40. The sums of COD, BOD-5 corrected for algal biomass, direct counts on beef-peptone-agar (BPA) 10 days and 5 days coliforms showed a direct significant correlation to mean water discharge. The effect of Orlik Reservoir on decrease of COD and BPA-10 bacteria at the Slapy Reservoir surface was observed at the beginning of the second year after filling of Orlik; on direct bacteria counts from the third year, and on BOD-5 from the fourth year onwards. (See also W74-05068) (Jones-Wisconsin)
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.

P. Javornicky, and J. Komarkova.
In: 'Hydrobiological Studies 2, 'Academia Publishing House, Prague. 1973. p 155-211. 33 fig, 6 tab, 55 ref.

Descriptors: *Plankton, *Primary productivity, *Reservoirs, Phytoplankton, Photosynthesis, Biomass, Chlorophyll, Algae, Solar radiation, Temperature, Phosphorus, Discharge(Water), Seasonal, Diatoms, Anabaena, Stratification, Cyanophyta, Light penetration, Chlorophyta.
Identifiers: *Slapy Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Results of an 8-year study of Slapy Reservoir, Czechoslovakia are given in connection with phytoplankton species, phytoplankton photosynthetic activity relationahip to biomass percentage of main phytoplankter groups, seasonal changes in parameters of plankton primary productivity, seasonal average of these parameters, mutual correlations between these parameters, and correlations between parameters of plankton primary productivity and several ecological factors. Cell volumes of most abundant phytoplankton species are tabulated. Species of algae dominating the phytoplankton biomass in the surface 3-m layer (trophogenic zone) at the standard sampling station during three main periods of the eight seasons of vegetation are listed. Two coefficients of photosynthetic activity of phytoplankton, namely turnover rate in situ and activity in vitro, are considered. Seasonal patterns and their changes during the years investigated are shown and analyzed. The differences between the seasonal averages were tested and the averages as well as the individual data are correlated both mutually and with the following ecological factors: incident solar radiation energy, Secchi disc readings, water temperature, concentration of total phosphorus, and discharge of reservoir water. The last two factors are demonstrated to be the most important for plankton primary productivity in Slapy Reservoir. (See also W74-05068) (Jones-Wisconsin)
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Hruska.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 213-247. 10 fig, 10 tab, 62 ref.

Descriptors: *Benthos, *Reservoirs, Temporal distribution, Oligochaetes, Diptera, Tripton, Tubificids, Littoral, Profundal zone, Biomass, Benthic fauna, Organic matter.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia).

In two consecutive years of benthic observations of Czechoslovakia Slapy Reservoir there were wide differences in organic matter supply brought into the reservoir by the Vltava River. This supply ceased in the second year after upstream Orlik Reservoir became operative. Benthic abundance and biomass were observed at transects 9 km and 33 km above Slapy dam. Additional samples were taken 35 km above the dam. Experiments with four protected bottom areas against fish predation were conducted at the 9 km transect. In 1960, benthos was quantitatively richest in the profundal of both transects. Oligochaeta were most important. In 1961 with the retention of river tripton in the upper Orlik Reservoir the huge quantities of Oligochaeta disappeared from the 33 km transect. he lower profundal became quantitatively the richest zone and changes of abundance and biomass differed from those in the preceeding year. Protection of the bottom areas against fish feeding indicated that differences between the quantitatively poor benthos in the littoral and sublittoral and rich benthos in the profundal must be ascribed to the better food conditions rather than to fish predation. (See also W74-05068) (Jones-Wisconsin)
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 249-316. 34 fig, 9 tab, 37 ref.

Descriptors: *Limnology, *Reservoirs, *Thermal stratification, *Temperature, Biomass, Temporal distribution, Stratification, Mathematical models, Phytoplankton, Zooplankton, Chlorophyll, Photosynthesis, Standing crops, Hydrology, Oxygen, Hydrogen ion concentration, Alkalinity, Nutrients, Primary productivity, Discharge(Water).
Identifiers: *Re-regulation reservoirs, Vltava Cascade(Czechoslovakia).

Investigations of two re-regulation reservoirs with short retention times, differing in inflowing water, are reported. Analysis was made of seasonal temperatures and an empirical temperature model developed for Czechoslovak Vltava Cascade and primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton studied. During two years of direct study and evaluation of 10-year data, temperature change within the poorly stratified water mass of the re-regulation reservoir was found to correlate with the air-water temperature gradient and retention time. In the re-regulation reservoir receiving a tributary river in addition to the upper reservoir outflow, the temperature changes were correlated with the mixing of the two inflowing water masses. Species composition, abundance and standing crop of phyto- and zooplankton, as well as the chlorophyll-a content and photosynthetic activity of phytoplankton are explained in connection with the phytoplankton origin of the re-regulation reservoir from the depths of the upstream reservoir. Log ratio phytoplankton production/zooplankton standing crop was found to increase logarithmically in reservoirs with renewal times more than 20 days, but to be renewal independent in highly throughflowing reservoirs. (See also W74-05068) (Jones-Wisconsin)
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Straskrabova, L. Prochazkova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 317-348. 10 fig, 14 tab, 21 ref.

Descriptors: *Reservoirs, *Chemical properties, *Bacteria, *Rivers, Hardness(Water), Coliforms, Phosphates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, Nitrogen, Conductivity, Discharge(Water), Tributaries, Primary productivity, Retention, Nitrates, Ammonia.
Identifiers: *Re-regulation reservoirs, Vrane Reservoir(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Vltava River(Czechoslovakia), Sazava River(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Whether the chemical or bacteriological composition of river water is changed after passage through a reservoir with short retention time (several hours to several days) and whether some features characteristic of static waters develop in such reservoirs were investigated. Of the two reservoirs on the Vltava River above Prague, a segment of the Vltava Cascade, Stechovice is supplied by outflow of Slapy Reservoir and Vrane is filled by the Vltava River flowing from Stechovice and by tributary Sazava River. Only significant changes found in the water after passage through Stechovice Reservoir were increases in total hardness, organic nitrogen, and coliform bacteria, and decreases in phosphate-phosphorus, COD and BOD-5. Water passing through Vrane Reservoir showed a significant decrease in COD during low discharge only and an increase in total phosphorus and phosphate-phosphorus, organic nitrogen, specific conductivity, BOD-5, and in numbers of bacterial groups. Bacterial numbers showed an indirect proportion to Vlt ava River discharge. Difference between the BOD-5 concentration in outflow and inflow of Stechovice Reservoir correlated directly with retention time. Difference in ammonia nitrogen concentration in the outflow and inflow of Vrane Reservoir correlated indirectly with primary production of phytoplankton and directly with both discharge of Sazava River and the percentage in the total reservoir discharge. (See also W74-05068) (Jones-Wisconsin)
W74-05074

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED, AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from the National Technical Information Service as AD-757 717 $6.00 paper copy, $1.45 in microfiche. Army Engineer District, Savannah, Georgia, Report April 1972. 373 p, 170 fig, 49 tab, 16 ref.

Descriptors: *Environmental effects, *Dredging, *Salt marshes, *Dikes, *Spoil banks, Deposition(Sediments), Water quality, Sediments, Biota, Georgia, Coasts, Metals, Estuaries, Aquatic plants, Benthos, Periphyton, Computer programs, Trace elements, Oxidation-reduction potential, Hydrogen ion concentration, Sulfides, Invertebrates, Mathematical studies.
Identifiers: Spartina alterniflora, Diversity indices, Intracoastal waterways, Savannah River(Ga.), Hell Gate(Ga.), Thunderbolt(Ga.).

Nature and magnitude of environmental changes resulting from dredging activities in salt marsh-estuarine environments of the southeastern Atlantic coast are evaluated. Water quality changes where diked and undiked techniques were used, salt marsh sediment responses to deposition of dredged material, and changes in biota were studied where dredging took place. It is concluded that in natural and relatively unpollutted areas dredging has no significant effect on water quality where either diked or undiked techniques were used; in polluted areas, water quality impairment caused by dredging does not necessarily bear any simple relation to composition of sediment to be dredged. Since distribution of trace metals (micronutrients) in various valence states in marsh sediments has a characteristic distribution pattern with depth dependent on Eh, pH, and sulfide, changes occurring in the latter parameters during spoil material deposition can greatly affect distribution of the former. Combination of reduced sediments and micronutrients may be important to the healthy maintenance of the salt marsh plant, Spartina alterniflora. Analyses of data indicate that no effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredge areas along the Intracoastal Water Ways of Georgia could be delimited. (Jones-Wisconsin)
W74-05075

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.

W74-05111

HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH.
Pennsylvania State Univ., University Park. Dept. of Biology.
Copy available from GPO Sup Doc as EP1.16:18050OXJ05/4, $1.25; microfiche from NTIS as PB-227 571, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, May 1971. 113 p, 32 fig, 18 tab, 66 ref. EPA Grant No. 18050DXJ.

Descriptors: Fish physiology, *Bioassay, *Acidic water, Water pollution effects, Pennsylvania, Analytical techniques, Microscopy, Bioindicators, Toxins, *Brook trout, Minnows, Spectrophotometry, Spectroscopy, *Fish pathology.
Identifiers: *Fish histochemistry, Analytical histochemistry, Cytophotometry, *Longnose dace, *Fathead minnows, *Acid toxicants.

The feasibility of using histochemical and histopathological changes in brook trout, longnose dace and fathead minnows as bioindicators of acid pollution was investigated. Laboratory studies entailed using a gravity flow diluter system. Field studies involved using net traps in polluted streams. Exposure durations were 4-5 days and 28-30 days. Histochemical cytophotometric analyses were made of gills, Stannius corpuscle, blood, spleen, kidney and liver. The primary mode of acid toxicant action is gill damage which results in impaired respiratory, excretory and liver functions. Short term indices of acid stress include: colloidal iron and PAS staining of gills and renal Stannius corpuscles. A useful bioindicator of prolonged acid exposure is decreased azure B-RNA staining of liver cells; this assesses the extent of liver impairment and reflects of reduced tolerance of fish to other toxicants. Sublethal levels of acidity are not cumulative. However, pH levels of about 5.0 should be considered hazardous since they prove toxic to breeding fish having increased oxygen needs and also reduce the liver's ability to detoxify noxious substances present in acid polluted waters. (EPA)
W74-05113

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
Copy available from GPO Sup Doc as EP1.16:16070DCD09/70, $0.50; microfiche from NTIS as PB-228 263, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, September 1970. 38 p, 11 fig, 6 tab, 15 ref. EPA Project 16070 DCD, Contract 14-12-481.

Descriptors: *Biochemical oxygen demand, *Bottom sediments, *Sludge, Sodium chloride, Salts, Light, Estuaries, Temperature, *Washington, Dissolved oxygen.
Identifiers: *Warburg respirometer, *Bellingham Bay(Wash), *Benthic sludge.

A laboratory study has been conducted to show the application of the Warburg respirometer in evaluating the influence of light, sodium chloride, dilution salts, temperature and agitation on the maximu oxygen uptake rate of disturbed bottom sediments. Experiments were conducted on estuarian benthic material obtained from Bellingham Bay, Washington. In all experiments the initial oxygen uptake rate was the maximum uptake rate. Results obtained using distilled water as the suspending medium were not appreciably altered due to the addition of BOD dilution salts, or sodium chloride in concentrations less than 30,000 mg/l. The initial uptake rate also appears to be insensitive to light. Ambient temperatures were varied from 10C to 20C and agitation settings were varied from instrument maximum to twenty-five percent of maximum. The Squalicum Creek sample showed variations in initial uptake from 2,000 to 57,000 mg/l of oxygen per hour. The Whatcom Creek sample had a range from 2800 to 83,000 mg/l of oxygen per hour. Results indicate that the maximum uptake rate is very sensitive to temperature, degree of disturbance, and the total volatile solids concentration of the benthic material. Agitation alone was shown to account for at least a ten fold increase in the maximum oxygen demand. (EPA)
W74-05114

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W74-05173

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
For primary bibliographic entry see Field 5B.
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 5B.
W74-05190

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

PERSISTENCE OF RADIONUCLIDES IN SOIL, PLANTS, AND SMALL MAMMALS IN AREAS CONTAMINATED WITH RADIOACTIVE FALLOUT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05194

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
M. Merlini, F. Argentesi, A. Brazzelli, B. Oregioni, and A. Berg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 285-306, (1971), 7 fig, 7 tab, 24 ref.

Descriptors: Water pollution, Fish, Absorption, *Zonc, *Toxicity, *Public health, *Radioactivity, Food chains, Ecosystems, Lakes, Radioecology, Biological properties, Path of pollutants, Microbiology, Aquatic microbiology, Mercury, Cadmium, Heavy metals, *Sunfishes.
Identifiers: *Italy(Lake Maggiore).

The biological pathway of Zn-65 was studied in the freshwater fish Lepomis gibbosus, L. from Lago Maggiore (Lake Maggiore) in Northern Italy under different experimental conditions. The results showed that the biological half-times of accumulation (Tba) and the rates of accumulation (k) of radiozinc from water by fish fed rations with 16 ppm of stable zinc and for fish fed a zinc-free diet were significantly different. In the first case, the Tba was 97 days and k was equal to 0.007 per day; whereas in the second case, for fish on a zinc-free diet, the Tba was 27 days and the rate of accumulation was 0.027 per day. Fish without stable zinc in their diet accumulate their body burden at a faster rate than those with zinc in their diet. In addition, fish fed zinc-free ration accumulated significantly more radiozinc than those on a normal diet. Uptake data and bio-elimination half-times for Zn-65 absorbed from water by the fish are given in detail. From the investigations performed it was ascertained that zinc, an essential micronutrient, is homeostatically controlled by fish and that low levels of pollutants such as mercury and cadmium did not affect the total stable Zn content of the animal within the time limits studied. These metals do, however, inhibit the uptake of zinc as Zn-65 and the concentration of the nuclide. (See also W74-05181) (Houser-ORNL)
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
C. E. Cushing, and D. G. Watson.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 318-322, (1971), 4 fig, 1 tab, 8 ref.

Descriptors: Cycles, *Zinc, *Water pollution sources, Fish, *Carp, *Food webs, Research and development, Model studies, *Columbia River, Radioactivity, Water pollution, Absorption, Measurement, Equilibrium, Retention.

Experiment was designed to investigate the cycling of Zn-65 in a simple water-periphyton-fish food web under constant flow, light, and ambient radionuclide concentration. Water temperature followed the seasonal pattern of the Columbia River. Replicate experimental streams containing periphyton and young carp (Cyprinus carpio) were spiked continuously to maintain Zn-65 concentrations of approximately 1 and 10 pCi/ml - about 20 and 200 times that of the river water. Periphyton and fish were sampled at intervals to ascertain the time necessary to reach equilibrium. Subsequently, the spike was cut off and retention of the Zn-65 was followed. Concentrations of Zn-65 in periphyton approached equilibrium in about 28 days at levels of 17 and 90 nCi/g wet weight in the low- and high-level streams respectively. These represent concentrations of about 23 and 150 times that of the control periphyton and are very close to the differential spike levels in the water. This means that, under the conditions of this experiment, periphyton concentrates Zn-65 in nearly direct proportion to ambient concentrations. The specific activity of the periphyton at equilibrium was 35 and 210 pCi/mg in the low- and high-level streams respectively. The estimated effective half-life was about 15 days. Data on the fish were more variable due to the influence of temperature on metabolic rates. Approximate equilibrium was reached in about 43 days at concentrations of 0.25

and 1.3 nCi/g wet weight in the low- and high-level streams respectively. This represents concentrations of 6 and 29 times that of the control fish. Specific activities at this time were 3 and 20 pCi/mg. These data suggest that true equilibrium in the carp had not been reached. Water temperatures varied from 6 to 18C during the experiment, which ran from January to June. (See also W74-05181) (Houser-ORNL)
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
I. L. Ophel, and C. D. Fraser.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 323-327, (1971) 1 fig, 4 tab, 11 ref.

Descriptors: *Cobalt, *Ecosystem, Freshwater, *Lakes, *Dystrophy, *Eutrophication, Water pollution, Water pollution effects, Assay, Measurement, Radioactivity, Aquatic plants, Fish, Biota, Absorption, Lake morphology, Distribution, Sediments.
Identifiers: *Canada(Perch Lake).

Perch Lake is a small dystrophic-eutrophic lake on the property of Atomic Energy of Canada Limited at Chalk River, Ontario. For seven years it has been receiving at a relatively constant rate small amounts of Co-60 via its inlet stream, resulting in low, but measurable, concentrations of this radionuclide in the lake water. During this time water and food-chain components have been assayed for Co-60 content using a large-volume counter combined with a single-channel gamma-ray spectrometer. Concentration factors were determined for the dominant species of aquatic plants, fish, and other biota. Large differences in accumulation were found between species of plants due to morphology of the plants and their location in the lake. Differences between fish species are correlated with their feeding habits. The vertical and horizontal distribution of radiocobalt in the bottom sediments was investigated. Most of the nuclide is confined to the upper few centimeters of the organic-rich deposits. Calculations indicate that the lake sediment is an important storehouse of cobalt and that approximately 30% of the Co-60 that has entered the lake is now resident on the bottom. (See also W74-05181) (Houser-ORNL)
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
S. A. Spigarelli.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 328-333, (1971) 2 fig, 4 tab, 19 ref.

Descriptors: *Cesium, *Fallout, *Ecology, Population, *Largemouth bass, Radioactivity, Absorption, Assay, Measurement, Compatibility, Lakes, Michigan, Speciation, Correlation analysis, *Michigan.
Identifiers: *Wintergreen Lake(Mich).

In order to better define the variable accumulations of Cs-137 fallout by the individuals of a fish population, the effects of selected ecological parameters were tested. Individual fish characteristics (sex and weight), monthly precipitation, and time of year were statistically analyzed for their influence on Cs-137 activities of largemouth bass collected from Wintergreen Lake, Kalamazoo County, Michigan. Monthly collections of bass were analyzed for Cs-137 activity. No significant difference in Cs-137 activity was detected between male and female bass of equal size. However, body weight was a significant factor; larger bass accumulated more Cs-137 and total Cs per unit weight than small bass. The plots of Cs-137 vs weight and total Cs vs weight were very similar and supported the specific activity concept. The relationship between weight and Cs-137 in bass was estimated to be curvilinear with positive slope up to approximately 1000 g and negative slope above 1100 g. Mean Cs-137 activities of bass collected monthly from May to October 1969 were significantly different. The maximum activities occurred during May, the minimum in August. No correlation was demonstrated between monthly precipitation levels and Cs-137 activities of bass. (See also W74-05181) (Houser-ORNL)
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
W. L. Stromberg, and C. J. Goodnight.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 410-416, (1971), 8 fig, 2 tab, 18 ref.

Descriptors: *Phosphorus, Kinetics, *Absorption, *Sorption, Retention, *Algae, *Bacteria, *Tubificids, Water pollution, Radioactivity, Radioactive tracer, Equilibrium, Worms, Ecology, Ecosystems.

Kinetics of accumulation and retention of P-32 were determined for unialgal cultures of Chlorella pyrenoidosa in carrier (52 mg Na2HPO4/liter) and carrier-free Knop's solution (modified) using 10 micron Ci P32/liter as tracer and a Geiger-Mueller counting system. Accumulation in a carrier-free solution was exponential and approached a 90% efficiency of removal within 30 min. In the carrier solution, accumulation was approximately linear and did not reach equilibrium within a 27-hr period. Using ouabain as an inhibitor, it was shown that the observed sorption of radiophosphate in carrier-free solution by this alga was independent of metabolic activity. Most loss of the phosphate taken up in a 27 -hr interval occurred within 1 hr in agitated carrier and carrier-free Knop's solution. Accumulation of P-32 by tubificid worms was also studied using similar counting methods. Uptake by these worms was approximately exponential in media with a bacterial source of radiophosphate, and was reduced by addition of chloramphenicol and removal of P-32 from solution by algae. Preliminary results indicated that C. pyrenoidosa competed effectively with the worms for inorganic phosphate, and that accumulation of P-32 by ingestion of algae among tubificids may be slight. Ecological implications of these results are discussed. (See also W74-05181) (Houser-ORNL)
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. W. Schults, and K. W. Malueg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 417-424, (1971), 5 fig, 4 tab, 9 ref.

Descriptors: *Water pollution effects, *Lakes, *Radioisotopes, *Phosphorus, *Absorption, Ion exchange, Root system, Aquatic plants, Water, Sediments, Leaves, Silica, Sands, Transfer, Kinetics.
Identifiers: *Radiophosphorus, Sediment-water nutrient interchange.

Laboratory experiments were conducted to compare the uptake of phosphorus by roots and foliage of Elodea canadensis, Potamogeton amplifolius, and Vallisneria americana and to evaluate the cycling of radiophosphorus between the sediment and the water medium with the plant as the exchange agent. Intact plants were partitioned into root and foliage environments. For the comparison the radiophosphorus isotopes P-32 and P-33 were used simultaneously in the separate environments. Three different root media were evaluated for their influence on phosphorus uptake by the plants: lake water, silica sand saturated with lake water, and lake sediment saturated with lake water. All three species had higher uptake by the foliage than by the roots. For Potamogeton and Vallisneria, uptake by the foliage was greatest for plants rooted in sediment, less for those rooted in sand, and least for those rooted in lake water. For Elodea, uptake by the foliage was not statistically different for the three rooting media. For all experiments, except Vallisneria rooted in sand, there was a direct positive relationship between total uptake and percentage of radiophosphorus derived from the rooting medium. Only about 1% of the radiophosphorus in the foliage medium was transferred downward to the root medium. Up to 54% of the radiophosphorus added to the root medium was transferred through the plant and into the foliage medium. This process may constitute a significant sediment-water nutrient interchange mechanism in the littoral regions of lakes. (See also W74-05181) (Houser-ORNL)
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
A. Lerman, and H. Taniguchi.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 460-464, (1971), 1 fig, 5 tab, 14 ref.

Descriptors: *Fallout, *Strontium, *Cesium, *Lake sediments, *Great Lakes, *Radioactivity, Lake Ontario, Lake Superior, *Assay, Watersheds(Basins), Sedimentology, Deposition(Sediments), Lake Michigan, Lake Huron, Lake Erie, Transfer, Discharge, Movement, Precipitation(Atmospheric).

Input of Sr-90 into the Laurentian Great Lakes was estimated from the rates of deposition of nuclear fallout in atmospheric precipitation over the lake surface and land drainage basin of each lake, for the period 1954-69. The amount of Sr-90 accumulated in the sediments of Lakes Superior, Michigan, and Ontario is only a small fraction (2-6%) of the total amount introduced into the lakes. The amount of Cs-137 in sediment cores from Lakes Ontario and Superior is 20-35 times greater than the amount of Sr-90. These high concentrations of Cs-137, viewed against the value of 1.45 for the Cs-137/Sr-90 ratio in atmospheric fallout and 0.16-0.36 in the Great Lakes waters, indicate that Great Lakes sediments strongly control the concentration of Cs-137 in lake water. (See also W74-05181) (Houser-ORNL)
W74-05208

CHANGES IN MORPHOLOGICAL COMPOSITION OF THE BLOOD OF LARVAL FISH BITTEN BY WATER BUGS FAM. CORIXIDAE), (IN RUSSIAN),
L. D. Zhiteneva, and N. P. Sokol' skaya.
Vopr Ikhtiol. Vol 12, No 1, p 179-185. 1972. Illus.
Identifiers: *Corxidae, Erythrocyte, Fish morphology, Hemolysis, Larval fish, *Water bugs, Fish blood, *Corp, *Sterlet, Fish pathology, Fish parasites, *Fish poisons.

Blood changes in larvae of 3 different species of fish (pond carp, grass carp and sterlet) following a

bite by water bugs were investigated. The poison of these fish parasites produces a degradation of erythrocytes, and hemolysis. Pathological changes include changes in white blood cells, production of many immature lympho- and leukoblasts. These irreversible processes lead to death of the fish. The most sensitive to the bite are the sterlets.--Copyright 1973, Biological Abstracts, Inc.
W74-05209

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
Z. F. Short, P. R. Olson, R. F. Palumbo, J. R. Donaldson, and F. G. Lowman.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 474-485, (1971), 7 fig, 5 tab, 39 ref.

Descriptors: *Radioisotopes, *Molybdenum, *Lakes, Ecosystems, *Radioecology, *Washington, Crayfish, Periphyton, Aquatic environment, Food chains, Trout, Clams, Absorption, Transfer, Nutrient requirement.
Identifiers: *Fern Lake(Wash.).

The bioaccumulation of molybdenum, marked with Mo-99, was followed in month-long studies in an aquarium, where water, not food, was the major source of the nuclides, and in Fern Lake, where assimilation by organisms isolated in live-boxes was compared with assimilation by those with access to their usual sources of food. In the aquarium containing 3.3 ppm of the metal, the alga Nitella flexilis accumulated up to 130 ppm molybdenum, a 'luxury' amount. In Fern Lake, with 0.014 ppb, the maximum concentration in the N. flexilis was 8.8 ppb. Uptake in the lake was irregular because of local chemical conditions in the water. The concentration in periphyton from the lake shore-line reached 50 ppb. All the tissues dissected from clams, crayfish, and trout, in the aquarium contained some molybdenum. In trout the least amounts were in the gastrointestinal tract. In the lake, small amounts were in a few trout held without food in the live-boxes, but concentrations were upto 16 ppb in the gastrointestinal tract and liver of fish which were free to feed. The concentrations in the liver of fingerlings exceeded that in the yearlings by a factor of 4. (See also W74-05181) (Houser-ORNL)
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
D. H. Vickers, and C. E. Boyd.
In: CONF-710501-P1-Proceedings of the Third National Symposium on Radioecology, May 10-12, (1971), Oak Ridge, Tenn. p492-496, 1971, 4 fig, 1 tab, 8 ref.

Descriptors: *Organic pesticides, *Carbon radioisotopes, *Absorption, Freshwater, *Phytoplankton, Effects, Measurement, Bioassay, Chlorophyll, Ecosystems, *Water pollution effects, *Insecticides.

The effect of ten organic insecticides upon carbon dioxide fixation by phytoplankton was measured in situ by the C-14 bioassay technique. The following insecticides were tested individually at concentrations of 10 ppm: dieldrin, endrin, DDT, toxaphene, malathion, methyl parathion, mirex, sevin, metacil, and furadan. Only the carbamates (sevin, matacil, and furadan) and toxaphene consistently inhibited C-14 uptake under the test conditions. Further tests with the carbamates revealed that concentrations of 3 to 5 ppm of sevin and matacil resulted in about 50% reduction of C-14 uptake as compared with C-14 uptake by the control. Concentrations of 15 ppm of these two compounds almost completely inhibited C-14 uptake. A similar response curve was obtained for furadan, but C-14 uptake was reduced by only 60% at 15 ppm of this insecticide. The carbamate compounds greatly reduced concentrations of chlorophyll A in phytoplankton cultures within 24 hr. (See also W74-05181) (Houser-ORNL)
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON THE NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
G. M. Simmons, Jr., and J. R. Reed, Jr.
In: CONF-710501-p1-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridg,e Tennessee. p 497-510, (1971) 15 fig, 5 tab, 10 ref.

Descriptors: *Water pollution effects, *Aquatic environment, Rivers, *Ecosystems, *Virginia, Nuclear powerplants, Lake impoundments, Reservoir storage, Reservoir releases, Direct benefits, Real benefits, Induced benefits, Ecology.
Identifiers: *North Anna River(Va.).

The North Anna River is a major tributary of the York River, which empties into the Chesapeake Bay. The ecological properties of a major portion of the North Anna River have been severely altered by more than 100 years of acid drainage from abandoned iron pyrite mines. Virginia Electric and Power Company is constructing a 13,000-acre impoundment within the disturbed area to provide cooling water for a 4,000,000-kW nuclear-powered electrical generating facility. Results from a preimpoundment study and inspection of the proposed reservoir construction and operation indicate that the facility will have a beneficial effect on the ecological properties of the lower North Anna River basin by accelerating the rate of recovery in the river below the dam. (See also W74-05181) (Houser-ORNL)
W74-05212

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
J. A. Ruzicka, L. Mrklas, and K. Rokytova.
Caries Res. Vol 7, No 2, p 166-172, 1973. Illus.
Identifiers: Bones, *Caries, *Fluoride, *Fluorosis(Incisor), *Mice, Teeth, Tibial, Potable water.

Mice were given sodium fluoride solutions to drink in various concentrations and in various daily doses for a period of 200 days. At the end of experiment, both the fluoride content and the degree of fluorosis of the incisor teeth depended only on the concentration of fluoride in the administered solutions. The total daily fluoride intake was without effect. Both fluoride concentration in the drinking water and the total daily intake of fluoride produced effects in the tibia even after 220 days of experiment. This was caused by a great proportion of the bone which was not available to fluoride exchange while the unavailable bone conserved the state existing earlier. The importance of these results for dental caries prevention is discussed. The administration of fluoride in the form of fluoridated drinking water appears to be most advantageous.--Copyright 1973, Biological Abstracts, Inc.
W74-05246

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-05248

PCB RESIDUES IN PLANKTON FROM THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W74-05256

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W74-05270

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 5B.
W74-05284

THE ULTRASTRUCTURE OF AN ALLOPARASITIC RED ALGA CHOREOCOLAX POLYSIPHONIAE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
P. Kugrens, and J. A. West.
Phycologia, Vol 12, Nos 3/4, p 175-186, December 1973. 12 fig, 19 ref.

Descriptors: *Rhodophyta, *Parasitism.
Identifiers: *Ultrastructure, *Choreocolax polysiphoniae.

An alloparasite, Choreocolax polysiphoniae, apparently represents one of the most evolved parasitic red algae. Chloroplasts are highly reduced and consist of double membrane limited organelles lacking any internal thylakoid development. The uninucleate cells have thick walls, an absence of starch in cortical cells and large quantities of starch in medullary cells. Host-parasite concentrations are made by typical red algal pit connections. General effects of the infection on the host include cell hypertrophy, decrease in floridean starch granules, dispersed cytoplasmic matrices, and contorsion of chloroplasts. (Little-Battelle)
W74-05299

RESEARCH ON RED ALGAL PIGMENTS. 5. THE EFFECT OF THE INTENSITY OF WHITE AND GREEN LIGHT ON THE RATE OF PHOTOSYNTHESIS AND ITS RELATIONSHIP TO PIGMENT COMPONENTS IN GRACILARIA COMPRESSA (C. AG.) GREV. (RHODOPHYCEAE, GIGARTINALES),
Bari Univ. (Italy). Inst. of Botany.
G. Calabrese, and G. P. Felicini.
Phycologia, Vol 12, Nos 3/4, p 195-199, December 1973. 1 fig, 2 tab, 22 ref.

Descriptors: *Rhodophyta, *Plant pigments, *Photosynthesis, *Light intensity, Chlorophyll, Respiration, Bioassay.
Identifiers: Gracilaria compressa, Green light, White light, Sunlight, Phycoerythrin, Carotenoids, Adriatic Sea, Sample preparation, Chlorophyll a, Carotene, Zeaxanthin, Lutein, Biliprotein.

The effects of green and white light at different intensities upon photosynthetic rates of Gracilaria compressa and their relationships to different pigment contents are reported. This is a typical rhodophycean alga, with adaptation to light intensity in the fronds of individual plants. In fact, the green distal portion which is exposed to direct sunlight (within a depth of a few meters), lacks phycoerythrin and shows a great proportion of carotenoids. The red proximal portion, which receives less light as a result of self-shading,

synthesizes phycoerythrin and more chlorophyll. The photosynthetic activity in the two portions, assayed under different light conditions, indicates that the abundant oxygen output in the basal red part of the thallus, also at low light intensity, may be due to a high content of photosynthetic pigments. Conversely, the absence of phycoerythrin and lower chlorophyll content in the distal yellow-green part permits a reasonable photosynthetic rate only at higher light intensity. This is especially apparent in green light: at 250 lux no photosynthetic activity is to be seen in the yellow-green thallus, while the red portion reaches the compensation point. (Mortland-Battelle)
W74-05300

POLYCHLORINATED BIPHENYLS IN THE SEASTAR ACANTHASTER PLANCI,
Walla Walla Coll., College Place, Wash. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-05301

CONTRIBUTION TO THE GENERAL PATHOLOGY OF ENDOCARDIAL REACTIONS: TOXIC ENDOCARDIAL LESIONS IN LOWER VERTEBRATES (CARP), (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Max von Pettenkofer Institut.
D. Schulz.
Virchows Arch Abt A Pathol Anat. Vol 358, No 3, p 273-280, 1972, Illus. (English summary).
Identifiers: Bacteria, Cardial, *Carp, *Endocardial reactions, Exposure, Granuloma, Lesions, Vertebrates, *Toxicity, *Herbicides(Karmex) Fish pathology.

When carp were exposed to the herbicide Karmex (active ingradient 80% diuron) in laboratory conditions or in a pond they showed changes in the endothelial cells of the cardiac valves with concentrations of 0.1 ppm diuron or more. The endocardial changes ranged from slight to marked with numerous granulomas. The severity of histopathological findings depended on the concentration and time of exposure.--Copyright 1973, Biological Abstracts, Inc.
W74-05308

SPATIAL VARIABILITY OF THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
T. Platt, and C. Filion.
Limnology and Oceanography, Vol 18, No 5, p 743-749, September 1973. 1 fig, 3 tab, 20 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Biomass, *On-site tests, Habitats, Homogeneity, Variability, Spatial distribution, *Canada, Water sampling, Sea water, Chlorophyll, Radioactivity techniques, Incubation, Statistical methods, Light, Photosynthesis.
Identifiers: Contemporaneous disequillibrium, Sample preparation, Dark bottle tests, Analysis of variance, Light bottle tests, Data interpretation, Errors, *Bedford basin(N.S.).

The productivity:biomass (P:B) ratio for phytoplankton was studied using a replicated sampling design at six stations in a small marine basin. On six out of ten sampling days, statistically significant differences were revealed in the P:B ratios between stations. This result is consistent with the concept of contemporaneous disequilibrium which emphasizes the spatial component of the heterogeneity of the phytoplankton habitat. The measurements were made in the Bedford Basin, Nova Scotia. Six sampling stations were used. On each of 10 sampling days, each station was visited and 15 liters of seawater collected from 5-m depth. The water from each station was stored in a separate carboy. When water had been gathered from all six stations, each carboy was shaken thoroughly and the following samples drawn off: six replicate 1-liter samples for chlorophyll analysis; six replicate light bottles and four replicate dark bottles for C-14-uptake measurement. All of the replicates for C-14-uptake measurement, a total of 60, were incubated at station 1 at 5-m depth. The in situ incubation of the C-14-uptake experiments lasted 4 hr. Chlorophyll was used as an index of phytoplankton biomass. An analysis of variance design permitted calculation of the standard errors of chlorophyll and C-14 uptake in the light and dark. Using these, the standard errors of the P:B ratios were calculated and compared between stations on the same day. (Mortland-Battelle)
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
A. Zo.
Limnology and Oceanography, Vol 18, No 5, p 750-756, September 1973. 5 fig, 2 tab, 20 ref.

Descriptors: *Breeding, *Growth rates, Worms, Sea water, Water sampling, Water temperature, *Canada, Reproduction, Secondary productivity, Respiration, Life cycles.
Identifiers: *Sagitta elegans, Chaetognaths, Sample preservation, Bedford Basin(N.S.), Macroinvertebrates.

This work was an attempt to examine a complete cycle of breeding and growth of Sagitta elegans Verrill, the only chaetognath found in Bedford Basin. Bedford Basin is an oval-shaped depression about 7 km long and 4 km wide with a maximum depth of 70 m. It is connected to the coastal water of Nova Scotia through a southeastern channel. A collection was taken every 2 weeks during daylight hours from 6 November 1967 to 21 February 1969 at a single station in the deepest part of Bedford Basin (depth 68 m, tidal range plus or minus 2 m). Samples were preserved immediately in an 8 percent Formalin-seawater solution. In the laboratory, counting, measuring, and stage separation were carried out under the microscope, usually on the day following collection. Within 1 year two generations of Sagitta elegans were found. The spring generation, reaching maturity of mid-September, reproduced during the remainder of the year. The autumn generation, consisting of the offspring of the spring generation, appeared to overwinter and established the spring adult population. The temperature-size relationship of S. elegans from Bedford Basin is in close agreement with McLaren's curve for this species in the eastern Canadian Arctic. Net carbon production rate, calculated from the spring generation, was highest in mid-September when the majority of the population approached maturity. (Mortland-Battelle)
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANGMUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
D. G. George, and R. W. Edwards.
Limnology and Oceanography, Vol 18, No 5, p 798-800, September 1973. 2 fig, 9 ref.

Descriptors: *Daphnia, *Distribution patterns, Light intensity, Winds, Reservoirs, Sampling, *Eutrophication, Water pollution effects.
Identifiers: *Langmuir circulations, Daphnia hyalina, Foamlines, Macroinvertebrates, Vertical distribution.

Crustacean zooplankton distribution was studied in Eglwys Nynydd, a eutrophic reservoir near Port Talbot, S. Wales. The reservoir is exposed to the prevailing winds blowing in from the sea and never stratifies thermally. Daphnia hyalina var. lacustris (Sars) dominates the zooplankton, both numerically and in terms of biomass, throughout the year. Studies of the vertical distribution of the species collected over 2 years have shown that the animals tend to avoid the surface waters in daylight. Continuous horizontal samples of zooplankton were taken with a self-priming pump (30 liters/min capacity) connected to a sectional intake boom installed on a small boat. When used to examine distributions within Langmuir spirals the intake boom was positioned just below the surface (10-30 cm) and run first along, and then midway between, well-defined foamlines. Water was pumped directly into 2-liter containers in the boat for subsequent filtration on shore and all the Daphnia in each sample were counted. Daphnia hyalina was concentrated near the surface midway between the foamlines of Langmuir circulations that developed in a shallow reservoir at wind speeds above 400 cm/sec. Such concentration was probably caused by the antagonistic factors of upward water transport carrying D. hyalina to the surface zone and oriented movements away from this region of high light intensity. (Mortland-Battelle)
W74-05318

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W74-05323

EFFECTS OF RED MUD ON MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
R. A. A. Blackman, and K. W. Wilson.
Marine Pollution Bulletin, Vol 4, No 11, p 169-171, November 1973. 1 tab, 7 ref.

Descriptors: *Toxicity, *Waste disposal, *Marine fish, *Clams, *Shrimp, *Oysters, Bioassay, Water pollution effects, Industrial wastes, Mortality.
Identifiers: *Red mud, Scrobicularia plana, Cardium edule, Solea solea, Mytilus edulis, Crangon crangon, Agonus cataphractus, Germany, United Kingdom, North Sea, Bristol Channel.

Red mud, which is a waste product from the reduction of bauxite in the production of aluminum, has been disposed of in Bristol Channel by the UK with no apparent harmful effects. However, in considering the North Sea as a potential dump for red mud, Germany concluded that such disposal would be inadvisable because of detrimental effects on fauna. To determine whether the difference in results occurred from differences in chemical or physical characteristics of the red muds, bioassays were conducted with red muds from the UK and Germany. Red muds contain various quantities of Fe2O3, Al2O3, SiO2, Na2O, CaO, TiO2, and ash. The experimental solutions were prepared from settled solids; the UK material had about 26 percent solids and the German 55 percent. The experiments were of two types: exposure to red mud settled on a substrate or red mud maintained in suspension. Scrobicularia plana, a deposit-feeding bivalve, Cardium edule, a suspension-feeding bivalve, and Solea solea, a bottom-living flatfish, were exposed to the deposits (5.0-50 mg/sq cm). Mytilus edulis, Crangon crangon (brown shrimp), and Agonus cataphractus (armed bullhead) were exposed to the suspension (up to 33 g/l). All organisms seemed to be unaffected by red mud except the armed bullhead. At 33 g/l, all bullheads died within 72 hr. No mortality occurred in 72 hr with 3.3 g/l red mud. On the evidence of the comparative studies it is concluded that the differences in origin and treatment of bauxite result in red muds of only slightly different toxicities. The physical and

chemical characteristics of the waste and its observed effects on plants and animals in the laboratory are important considerations, but they must be related to the hydrographic and biotic features of the proposed disposal site, to the quantities involved and to the method of disposal. (Little-Battelle)
W74-05325

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W74-05326

STUDY OF METABOLIC REGULATIONS BETWEEN CYANOPHYCEAE AND FISH (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. Ya. Malyarevskaya, T. I. Birger, O. M. Arsan, and V. D. Solomatina.
Gidrobiol Zh, Vol 8, No 3, p 47-55, 1972, Illus, English summary.
Identifiers: *Cyanophyceae, *Fish metabolism, Microcystis-aeruginosa, Nitrogen, Oxygen, *Toxicity, Hydrochemical regime.

The problems of the effect of Cyanophyceae (Microcystis aeruginosa) on fish were studied. Changes in the hydrochemical regime in the fish environment under effect of Cyanophyceae, changes in the O2 consumption intensity, N metabolism, biochemical composition of fish under different Cyanophyceae concentrations in environment are shown. Some mechanisms of the toxic effect on fish are detected.--Copyright 1973, Biological Abstracts, Inc.
W74-05327

PHILOMETRA NODULOSA IN WYOMING WHITE SUCKERS,
Wyoming Game and Fish Commission, Casper.
T. J. Clifford, and S. Facciani.
Prog Fish-Cult, Vol 34, No 4, p 235-236, 1972, Illus.
Identifiers: *Copepod, Philometra-nodulosa, *White suckers, *Wyoming(Ocean Lake), *Water temperature, *Nematodes.

A severe infection by the nematode P. nodulosa was observed in the fins of the white sucker population of Ocean Lake, Wyoming. Information on the infection rate, migration date, and midlake water temperature was collected. Water temperature appeared to be the principal factor governing migration of the female nematode from the fins of the fish. Only the female P. nodulosa is infective in the fins, 'cheek galleries,' and gular areas of fish and subsequently migrates from the fishes body to release larvae from its enlarged uterus. The larvae are ingested by copepods which are in turn ingested by fish where they become reinfective as adults.--Copyright 1973, Biological Abstracts, Inc.
W74-05329

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from NTIS, Springfield, Va 22151 AD-757 717 Price $6.00 printed copy; $1.45 microfiche.
Contract Report, April 1972. 373 p, 141 fig, 60 tab, 16 ref. Army Corps of Engineers Contract DACW 21-71-0020.

Descriptors: *Dredging, *Environmental effects, *Salt marshes, Wetlands, Spoil banks, Water pollution effects, Silting.

The environmental response to the deposition of dredged material on salt marshes was studied in diked and undiked confinements. Studies of water quality changes, studies of salt marsh sediment responses, and biological studies were directed toward identifying any changes in the biota in areas of dredging activities. In natural and relatively unpolluted areas, dredging has no significant effect on water quality where diked or undiked techniques are used. In polluted areas in marine environments, water quality impairment is caused by dredging activities. The time that the water with the dredge material is allowed to stay in the spoil area may greatly influence the quality of the effluent from the spoil area. The depth of spoil material deposited on the salt marshes will greatly affect the time of reequilibration of the salt marsh vegetation to its original configuration. No effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredged areas along the Intracoastal Waterway of Georgia could be defined. Seasonal patterns between experimental and control stations showed no deviations outside of apparent normal ones. In addition, samples obtained immediately prior to, during, and after dredging showed no patterns which could specifically be assigned to effects of dredging. (Knapp-USGS)
W74-05332

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 6G.
W74-05338

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
For primary bibliographic entry see Field 3F.
W74-05341

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
Paul Parey: Berlin, West Germany. 1970. 227 p. Illus.
Identifiers: Books, Dust, Fluorides, Gas, *Immission damage, Lime, Metals, Nitrates, Nitrites, Nonparastic diseases, Smog, Smoke, Solid wastes, *Air pollution effects, *Water pollution effects, *Bibliographies.

Aspects of protection for a wide range of plants, especially cultivated plants, against immissions are discussed. Immissions include SO2, fluoride compounds, ammonia, H2S, nitrous gases, H2SO4, chromic acid, smog and peroxyacetyl nitrate, nitrite, lime, alkali, basalt, metal, arsenic and grain dusts, and ashes. The damage to the plants, their mode of effect, plant resistance and determination of these immissions in the atmosphere are discussed. The effect of waste water and solid wastes on plants and soil, the fertilizer value of some household and industrial wastewater and damage caused by alkali salts, trace elements, organic substances, detergents, radioisotopes, compost, sewage sludge, mineral oil products and solid industrial wastes are also discussed. An extensive bibliography is included at the end of each section.--Copyright 1973, Biological Abstracts, Inc.
W74-05342

BIONOMICS OF CYCLOPS STRENUUS ABYSSORM SARS (COPEPODA:CYCLOPOIDA),
Freshwater Biological Association, Ambleside (England).
W. J. P. Smyly.
Oecologia (Berl). Vol 11, No 2, p 163-186. 1973. Illus.
Identifiers: Biomass, *Bionomics, *Copepoda, Cyclopoida, Cyclops-Strenuus-Abyssorum, Dissolved oxygen, Fecundity, Lakes, Production, Sewage, Water pollution effects, *English Lake District.

The annual cycle of C. strenuus abyssorum in some lakes of the English Lake District is described. Esthwaite Water, Rydal Water and Grasmere, all enriched by sewage, and Buttermere, a relatively unproductive lake, were sampled most frequently. There is only 1 effective generation in the year in each of these lakes. Individuals hatch from eggs laid in the spring. In the deepest of the 4 lakes (Buttermere), these individuals reach the adult stage in early winter, pass the winter in the planktonic zone and start laying eggs early in the following year. In the other 3 lakes, most individuals of the spring generation reach the 5th copepodid stage by mid-summer and then spend the next 8 mo. in the profundal zone. They leave this zone in Feb. or March to return to the planktonic zone, become adult and start breeding. In July a few individuals may mature in the planktonic zone. A correlation between the time in mid-summer when stage V copepodids appear in the profundal zone of the 3 shallower lakes and amounts of dissolved O2 in this zone is shown. Although a correlation of this kind is plausible, presence of stage V copepodids in a deep, well oxygenated lake (Tirlmere) suggests that a casual connection of this kind is too simple an explanation. Rates of development of the different instars were experimentally at constant temperatures and used to estimate production. Production, biomass and fecundity were all higher in Esthwaite Water than in the other 3 lakes.--Copyright 1973, Biological Abstracts, Inc.
W74-05344

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
K. I. Andon.
Agrokhimiya. 3, p 107-111. 1972.
Identifiers: *Boron, Decorative qualities, *Manganese, Ornamental plants, *Petunia plants, Seeds, *Trace elements, Yield, *Zinc.

Supplemental, foliar application of B, Mn and Zn improves the water regimen and increases the ornamental quality, seed production and fragrance of hybrid petunia plants.--Copyright 1973, Biological Abstracts, Inc.
W74-05345

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
K. W. Jensen, and E. Snekvik.
Ambio, Vol 1, No 6, p 223-225, 1972, Illus.
Identifiers: *Norway, Fish populations, *Salmon, *Trout, *Hydrogen ion concentration, Fish hatching, Fish mortality.

Low pH levels in rivers of southern Norway have resulted in the mortality of trout and salmon. Experiments show that the lower pH limits for normal hatching and fry development are pH 5.0-5.5 for salmon, 4.5-5.0 for sea trout and ca pH 4.5 for brown trout. An examination of the relation between pH values in the rivers and lakes in question and salmon and trout populations shows that these fish populations generally decrease in size as the pH level decreases.--Copyright 1973, Biological Abstracts, Inc.
W74-05356

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
M. Bisiach.

Riv Patol Veg, Vol 8, No 2, p 159-181, 1972, Illus, English summary.
Identifiers: *Algae control, *Algicides, Benzuride, Captafol, Chloroacetamido-3, Folpet, Hydrodictyon-reticulatum, Laboratory tests, *Naphtho quinone derivatives, Oedogonium, Potassium permanganate, *Rice fields, Spirogyra, Tests.

Benzuride, Captafol, HOE 2997, Folpet and KMnO4 at 0.5, 1, 2, 4 and 8 ppm were tested against Spirogyra sp., Oedogonium sp. and Hydrodictyon reticulatum. Rice seedlings are often killed by suffocation caused by algal scum. All the chemicals except Benzuride showed marked algicidal activity. HOE 2997 (2,dichloroacetamido-3,chloro,1,4naphthoquinone) has a complete algicidal activity at 1 ppm against Oedogonium sp. and H. reticulatum and at 2-4 ppm against Spirogyra. The naphthoquinone derivative was not phytotoxic for rice, and is recommended for the control of algae in rice fields.--Copyright 1973, Biological Abstracts, Inc.
W74-05357

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
R. Zitnan.
Helminthologia (Bratisl). 11. p 141-146, 1970, English summary.
Identifiers: *Carp, *Czechoslovakia(Slovakia), *Dactylogyrus-extensus, Distribution, Epizootiological studies, *Monogenoidea.

Carps (1350) were examined in Slovakia (CSSR) in 54 localities of different water types during 1957-1969. D. extensus was found in all localities, its total distribution rate being 82.9% with a frequency rate of 1-246 specimens. The importance of D. extensus in early spring at a water temperature below 10C when young carp may be seriously endangered in hibernation ponds is indicated.--Copyright 1973, Biological Abstracts, Inc.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
F. Moravec.
Helminthologia (Bratisl). 10. p 107-114, 1969(1971), Illus.
Identifiers: Camallanidae, *Camallanus-lacustris, *Cyprinid, *Fish parasites, Host specificity, *Nematoda, *Perch, Reservoirs, *Salmonoid.

C. lacustris parasitizes mainly perch but can often be found in representatives of other families, e.g. Cyprinid and salmonoid fishes. Secondary invasions by adult parasitic worms from the original host to a new host fish are possible. The possibility of an atypical location of C. lacustris larvae in the host was investigated and no larvae were found in atypical locations.--Copyright 1973, Biological Abstracts, Inc.
W74-05359

COMPARATIVE STUDY OF THE EFFECT OF SOME ANION ACTIVE DETERGENTS ON THE REPRODUCTION OF LISTERIA MONOCYTOGENES AND OTHER BACTERIA,
J. Durst, J. Palicska, and A. Sawinsky.
Z Gesamte Hyg Grenzgeb, Vol 18, No 8, p 618-621, 1972, Illus.
Identifiers: Bacteria, *Bactericidal agents, *Detergents(Anion active), Escherichia-coli, *Listeria-monocytogenes, Pseudomonas-aeruginosa, Reproduction, Waste water.

The effects of Na dodecyl benzenesulfonate (DBS) and Na lauryl sulfate (LS) in concentrations up to 10000 microgram/ml on growth of L. monocytogenes, Pseudomonas aeruginosa and Escherichia coli cultures showed that at the doses used, both detergents had a bactericidal effect on L. monocytogenes. P. aeruginosa and E. coli were much less sensitive to the detergents. The intensity of the effect of the detergents was dependent on the substances in which they were dissolved; the bactericidal effect of DBS was higher in water and NaCl and the effect of LS was higher in meat broth boullion. Since only very high detergent concentrations have very high bactericidal effects in waste water, L. monocytogenes could occur in these waters. The occurrence of L. monocytogenes in surface waters is less probable, since lower detergent concentrations have a bactericidal effect.--Copyright 1973, Biological Abstracts, Inc.
W74-05360

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05375

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

5D. Waste Treatment Processes

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
L. W. Ross.
Copy Available from GPO Sup Doc as EPI.23:670/2-73-080, $1.00; microfiche from NTIS as PB-228 584 $1.45. Environmental Protection Agency Technology Series report EPA-670/2-73-080, September 1973. 64 p, 22 fig, 1 tab, 14 ref. EPA Project 14040 FZC.

Descriptors: *Mine drainage, Metals, Sulfides, *Neutralization, *Heavy metals, Chemical precipitation, *Waste water treatment, Colorado, Rocky mountain region, Computer programs, *Recycling, Costs, *Mine wastes.
Identifiers: San Juan Mountains, *Sulfide treatment, *Recovery(Mine wastes).

Heavy metals in mine drainage waters of the Rocky Mountains can be removed by a two-stage process consisting of (1) neutralization followed by (2) sulfide treatment. The first stage removes ferric and aluminum hydroxides, and the second (sulfide) stage precipitates the heavy metals that are most objectionable as pollutants, and that are of possible interest for economic recovery. The two-stage process has been demonstrated in the laboratory and in a field experiment. In the field, powdered lime was employed for neutralization, and barium sulfide was employed as sulfide source in a two-stage treatment tank. The ferric and aluminum hydroxides failed to settle when the slightest winds disturbed the surface of the settling pond, but the sulfides settled within a few feet downstream. The measured pH of treated streams has proven entirely satisfactory for control of chemical additions. A computer program based on published values of equilibrium constants and solubility-product constants is capable of adequate prediction of the required chemical quantities for treatment, and of the resulting metal concentrations in solution. The economics of chemical addition indicates that recovery of sulfides (CuS, ZnS) for sale to smelters can partially offset the cost of treatment, but never completely. (EPA)
W74-04851

DYNAMIC BEHAVIOR OF A COMPLETE-MIXING ACTIVATED SLUDGE SYSTEM,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
G. C. Y. Chu, L. E. Erickson, and L. T. Fan.
Biotechnology and Bioengineering, Vol 15, p 1101-1121, November 1973. 13 fig, 2 tab, 23 ref.

Descriptors: *Activated sludge, *Biological treatment, *Waste water treatment, Flow rates, Chemical oxygen demand, *Aeration, Organic matter, Cultures, Gravimetric analysis, Recycling, *Sludge treatment.
Identifiers: Wasting rates, Continuous cultures, Adenosine triphosphate, Dry weight.

The dynamic behavior of a laboratory-scale activated sludge biological waste treatment process with recycle and wasting of sludge was investigated by subjecting the system to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. The dynamic behavior of the system was examined by measuring adenosine triphosphate (ATP) in addition to dissolved chemical oxygen demand (COD) and cell dry weight in the aeration tank. Cell dry weight of the recycle flow and effluent COD were also measured. System performance changed appreciably when the system was subjected to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. Generally, the responses to a step increase and a step decrease of the same input variable were not symmetrical, especially in the response of the ATP concentration. The ATP/MLSS ratio was found to depend on the food-to-organism ratio in the aeration tank. When this ratio was small, the ATP/MLSS was large. The time constant analysis showed that the dry weight time constants were directly related to the sludge mean residence time; as the sludge wasting rate increased, the value of the time constant decreased. The time constants of the dissolved COD variation in the aeration tank were much smaller than those of the sludge dynamics. The dissolved COD time constants were found to be closely related to the fluid mean residence time in the aeration tank. (Mortland-Battelle)
W74-04900

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
J. Savage, T. Chase, Jr., and J. D. Macmillan.
Applied Microbiology, Vol 26, No 6, p 969-974, December 1973. 9 fig, 2 tab, 13 ref.

Descriptors: *Enteric bacteria, *Farm wastes, *Hogs, *Aerobic conditions, Waste treatment, Temperature, Hydrogen ion concentration, Oxidation-reduction potential, Environmental effects, Salmonella, Temperature, Sampling, Methodology, Decomposing organic matter.
Identifiers: Survival, *Composting(Windrow), Bacterial populations, *Thermophilic conditions, Fecal streptococci, Cellulolytic microorganisms, Fecal coliforms, Mesophilic microorganisms, Enterococci, Actinomycetes, Culture media, Selective media, Biochemical tests, Mesophilic bacteria, Mesophilic fungi.

Composting of wastes from swine feeding operations was studied. The effects of the frequency of turning the wastes and addition of straw to improve the physical structure was studied to determine the most effective technique to rapidly increase the temperature and, consequently, destroy coliforms and Salmonella. Four different treatments were studied; the results showed that, with addition of 5 percent (wt-wt) straw and mechanical turning of the compost 20 times per week, the temperature reached 60C within 3 days and enteric bacteria were destroyed within 14 days. The possibility of survival of pathogens at the cool surface

of a windrow operation, however, has not been disproven. The results indicate a marked decrease in coliforms, salmonellae, and enterococci during the thermophilic stage of composting. For maximal sanitary safety, the thermophilic stage of composting should be reached as soon as possible. A succession of microbial populations was observed during the composting process. The bacteria increased in number before the temperature of the windrows rose and then declined, whereas cellulolytic organisms and actinomycetes in general increased in the thermophilic stage. Presumably, the mesophilic bacteria rapidly attack the more readily available organic constituents, resulting in a temperature increase. The increased temperature favors the cellulolytic organisms, and the mesophilic bacteria largely disappear. The actinomycetes appeared in the final stage to such an extent that the surfaces of the compost piles were white or gray. These organisms are known to play a role in the humification of organic matter, which results in a stabilized product. (Holoman-Battelle)
W74-04908

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
E. J. Ciolkosz, L. T. Kardos, and W. F. Beers, Jr.
Available from the National Technical Information Service as PB-228 868, $10.25 in paper copy, $1.45 in microfiche. Pennsylvania State University Institute for Research on Land and Water Resources, Technical Completion Report, December 1973. 135 p, 24 fig, 30 tab, 38 ref, 1 append. OWRR A-027-PA(1). 14-31-0001-4038.

Descriptors: *Acid Mine Water, Percolation, Acidity, *Iron, *Conductivity, *Soil properties, Silt loam, Clay loam, Cation exchange, Water quality, Calcium carbonate, *Pennsylvania, *Hydrogen ion concentration, *Waste water treatment, Water pollution control.
Identifiers: Rayne silt loam, Guernsey silty clay loam, Soil pH, Renovation, Equilibration.

Equilibration of soil material from three horizons (Ap, B23 and Cl) at various ratios (1:1, 1:5 and 1:50) of soil to acid mine drainage water (AMW) indicated that maximum effect on pH, total acidity, conductivity, and iron content of the AMW occurred within five minutes and in the narrowest soil:AMW ratio. At 32 hours pH was increased from 3.1 to 6.6 with the Ap horizon material in the 1:1 ratio. The more acidic B23 and Cl horizons increased the pH one unit. Total acidity decreased 85%, 65% and 45% with the Ap, B23 and Cl materials, respectively. Conductivity decreased about 5 to 10%. Total iron content in the 1:1 system was decreased from 250-330 mg/l to a trace with all three soil materials. Percolation of AMW through reconstructed 40-inch soil profiles of Rayne silt loam and Guernsey silty clay loam at a loading rate of 5 inches at weekly intervals for 20 weeks increased pH of the AMW from 2.6-2.8 to 4.0 with the Rayne soil and to 8.0 with the calcareous Guernsey soil. Total acidity was decreased 75% with the Rayne soil while the Guernsey soil produced an alkaline column effluent. Iron was totally removed by both soils. Al was decreased 50% by the Rayne soil. The Guernsey soil totally removed Al, Zn, Cu, and Mn. Conductivity was decreased 16% by the Rayne and 11% by the Guernsey. Twenty-one soil samples (horizons) from seven Pennsylvania soils were equilibrated for 32 hours three times in succession in a 1:5 soil:AMW ratio. Multiple linear regression analysis was used to evaluate the effect of certain soil properties on the chemical quality of the equilibrated AMW. Most of the variation of pH, total acidity and iron was accounted for by cation exchange capacity and CaCO3 equivalent.
W74-04981

ECOLOGY OF DAPHNIA IN STABILIZATION PONDS,
Texas State Dept. of Health, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
Report 1973. 41 fig, 14 tab, 69 ref, appendix.

Descriptors: *Waste water treatment, *Daphnia, *Oxydation lagoons, *Biological treatment, Texas, Photoperiodism, Life cycles, Ammonia, Toxicity, Sulfides, Hydrogen ion concentration, Depth, Marketing, Design, Water quality, Bibliographies, Effluents, Crustaceans, Water purification, Algae, Rotifers, Dissolved oxygen, Hatching, Predation, Pilot plants.
Identifiers: *Daphnia similis, Daphnia pulex, Moina, Lemna.

It was observed that the presence of Daphnia resulted in clarified wastewater stabilization pond effluent in a few (6%) Texas locations. This investigation focused on the suitable environmental conditions for Daphnia and Moina. The two Daphnia species, D. similis and D. pulex, were only present in extra deep ponds. The manner in which Daphnia serves to stabilize and clarify water could include digestion processes, by incorporation of organics into biomass, and some material is rendered inert by conversion into chitin, the material of which Daphnia shells are composed. A limited market for Daphnia exists, but would quickly be satisfied should mass culture in wastewater prove feasible and offers a real possibility of gaining significant financial returns from a wastewater resource. A pilot plant operation indicated that successful operation required provision of adequate mixing-aeration to supply the respiratory needs and associated organisms and to preclude evolution of soluble sulfides from benthic deposits and to control pH within a range of 7.0 - 7.5. Daphnia culture (which is described) may be feasible to further improve effluents from secondary wastewater treatment plants due to its feeding habits on algae and other suspended organic material. Its life cycle and a pertinent literature review are included. (Auen-Wisconsin)
W74-05048

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
A. H. King, J. Ogea, and J. W. Sutton.
Copy available from GPO Sup Doc as EP1.23:660/2-73-018; $1.60; microfiche from NTIS as PB-229 408 $1.45. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-018, November 1973. 136 p, 21 fig, 20 tab, 14 ref. EPA Project 12110 GLP.

Descriptors: *Waste water treatment, Industrial wastes, Treatment facilities, *Synthetic rubber, *Louisiana, *Coagulation, Flocculation, *Flotation, *Biological treatment, Aerated lagoons, *Oxidation, Biochemical oxygen demand, Pilot plants, Construction costs, Operating costs, Design data.
Identifiers: Lake Charles(La).

The operation of a secondary waste-water treatment facility for treatment of the combined wastewater from Firestone's Lake Charles, Louisiana synthetic rubber manufacturing plant was studied for a period of nine months. The waste-water treatment facility was designed to treat an average daily flow of 3.4 mgd and a BOD load of approximately 2,000 lbs/day. The report describes the laboratory and pilot studies that were performed during the process development phase of the project and presents design data, operational data, and treatment cost data for the full scale facility. The effluent BOD concentration averaged 11.5 mg/l, with a suspended solids content of 29 mg/l. The BOD removal rate coefficient averaged .067 mg/l/day with an average BOD loading rate of .548 lbs BOD/day/lb MLSS. Capital costs including construction for the treatment facility were $1,472,528. Operational, maintenance, and depreciation costs were $.499/1,000 gals. of raw waste-water treated, excluding sludge disposal costs. (EPA)
W74-05105

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
Copy available from GPO Sup Doc as EP1.16:16110FPP 11/71, $3.00; microfiche from NTIS as PB-229 573 $1.45. Water Pollution Control Research Series, Environmental Protection Agency, November 1971. 206 p. EPA Project 16110 FPP.

Descriptors: *Planning, *River Basin development, *Pollution abatement, Optimum development plans, *Regional analysis, *Interstate Commissions, *Water supply, Land use, *Alternative planning, Waste disposal, *Waste water treatment, Sewage treatment, Projections, Human population, Water demand.
Identifiers: Waste treatment regionalization, *Delaware River(Tock's Island region).

This report, prepared for Delaware River Basin Commission presents the results of a study of the problem of water supply and waste disposal in the three-State, six-county region in which the Tocks Island Reservoir and the Delaware Water Gap National Recreation Area are being developed. Peak summer populations are projected over a 50-year period and utilities systems alternatives which could accommodate such projected growth are presented. Water supplies in the region are seen as adequate to meet future demands, with heavy emphasis on development of groundwater resources. Five alternative sewerage plans, ranging in degree of regionalization from 116 local treatment systems to a single system for the entire region, are outlined including detailed cost estimates. Preservation of water quality in the region is a primary objective of the study. (EPA)
W74-05108

TREATMENT OF LAUNDROMAT WASTES,
Rensselaer Polytechnic Inst., Troy, N.Y.
D. B. Aulenbach, P. C. Town, and M. Chilson.
Copy available from GPO Sup Doc as EP1.23/2:73-108, $0.95; microfiche from NTIS as PB-227 369 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-108, February 1973. 65 p, 18 fig, 20 tab, 10 ref. EPA Project 12120 DOD.

Descriptors: *Waste water treatment, *Recycling, *Filtration, *Ion exchange, Chemical precipitation, Effluents, Industrial wastes, Detergents, *Biochemical oxygen demand, *Chemical oxygen demand, *Alkylbenzene sulfonates.
Identifiers: Alum treatment.

Laboratory and field studies were conducted to evaluate the laundromat waste treatment capabilities and the effluent recycling possibilities of two systems. The Winfair Water Reclamation System (WWRS) involves the addition of alum at a pH of 4, sand filtration, and passage through an ion exchange resin. The American Laundry Machinery Industries (ALMI) Diatomaceous Earth Filtration System employs chemical precipitation prior to filtration. The WWRS resulted in a 61% BOD reduction, 71% COD reduction, 94% ABS reduction, and a buildup of total solids in the effluent. The system produced an effluent suitable for discharge into many streams. For effluent recycling, a functioning demineralizer would be required. The ALMI System achieved a 70% BOD reduction, 84% COD reduction, 98% ABS reduction, 94% PO4 reduction, and complete coliform removal. The increase in effluent alkalinity and hardness render very questionable the suitability of effluent reuse without softening and pH adjustment. The introduction of the system into existent

laundromats would increase the cost of washes by about 10 cents. (EPA)
W74-05109

KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
W. G. Timpe, E. Lang, and R. L. Miller.
Copy available from GPO Sup Doc as EP1.23/2:73-164, $1.25; microfiche from NTIS as PB-227 344 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-164, February 1973. 95 p, 8 fig, 18 tab, 110 ref. EPA Project 12040EJU.

Descriptors: *Waste water treatment, Industrial wastes, *Pulp wastes, *Activated carbon, *Water reuse, *Reviews, Surveys, Recycling, Municipal water, Industrial water, Oxidation, *Tertiary treatment.
Identifiers: Collection systems, Solids removal, *Lime treatment.

A survey is presented of the literature and other sources on present practices and advanced methods of handling and treatment of pulp and paper mill effluents, with particular emphasis on the kraft process, and the use of activated carbon and lime treatment as advanced methods of treatment. The survey was made as a first step of a development program aimed at maximum water reuse in kraft pulp and paper mills based on effluent treatment using activated carbon. The results of the survey include information on activated carbon and its applications in treatment of pulp and paper mill effluents as well as in treatment of municipal water supplies and effluents. Information is presented on lime treatment of kraft mill effluent and on other advanced treatment methods. It also covers the subjects of in-plant water reuse, effluent collection systems, solids removal, and biological oxidation. (EPA)
W74-05110

COMBINED SEWER OVERFLOW FOR THE HUDSON RIVER CONFERENCE,
Interstate Sanitation Commission, New York.
A. I. Mytelka, L. P. Cagliostro, D. J. Deutsch, and C. A. Haupt.
Copy availabe from GPO Sup Doc as EP1.23/2:73-152, $2.85, microfiche from NTIS as PB-227 341, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-152, January 1973. 287 p, 60 fig, 20 tab, 28 ref. EPA Contract 68-01-0055.

Descriptors: *Combined sewers, *Urban runoff, *Hudson River, *Interstate commission, Storm drains, *Sewers, Outfall sewers, *Treatment facilities, *Waste water treatment.
Identifiers: Solids removal, B.O.D. removal, Regulators.

A detailed examination was conducted of ten (10) combined sewer overflow systems within the portion of the Hudson River Basin lying within the Interstate Sanitation District. The work included the identification and study of these combined sewer systems in order to determine their location, physical characteristics, and service areas. The procedure employed included the physical examination of each system's regulators to determine their location, type, dimensions, and condition. A study of available records was made to determine, where possible, trunk line flow, interceptor line design capacity, and characterization of the drainage area served by each regulator which included population and land use. Ten (10) summary tables and forty (40) regulator location figures are included. Dry weather and wet weather sampling was also conducted. By-pass loadings for several pollution parameters have been calculated during storm flow conditions based upon this sampling. Recommendations for minimizing combined sewer overflows are included. (EPA)
W74-05112

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247a, $1.90; microfiche from NTIS as PB-229 466, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-247a, September 1973. 168 p, 29 fig, 39 tab, 23 ref. EPA Project 12010 FPK. Contract 14-12-870.

Descriptors: *Metals, Water pollution control, Mining, *Industrial wastes, *Waste water treatment, Costs, *Copper, *Zinc, *Lead, Byproducts.
Identifiers: Nonferrous metals industry, Smelting, Refining.

The purpose was to identify specific research needs in the area of water pollution in the primary nonferrous metals industries. This program consisted of a survey of literature and the acquisition of data from industrial operations. The contents of the final reports (2 volumes) include: the identification of process steps using water and/or generating wastewater, the amounts of water used for various purposes, recirculation rates, amounts of wastewaters, specific or characteristic substances in wastewaters, the prevalence of wastewater treatment practice, methods, and costs; current treatment problems, and plans for future practices of recirculation or wastewater treatment. The metals reported on included copper, lead, zinc, and associated byproducts (arsenic, cadmium, silver, gold, selenium, tellurium, sulfuric acid, salts and compounds), mercury, (primary) gold and silver, aluminum, molybdenum, and tungsten. The information includes detailed processing descriptions and flowsheets, tabulations of quantities of water intake, quantities used by category, recirculated water, discharge water quantities and analyses, water treatment costs. Representative water flowsheets are given. (See also W74-05117) (EPA)
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247b, $1.45; microfiche from NTIS as PB-229 467, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-247b, September 1973. 113 p, 16 fig, 30 tab, 31 ref. EPA Project 120/0 FPK. 14-12-870.

Descriptors: *Metals, *Industrial wastes, *Waste water treatment, *Aluminum, *Mercury, *Gold, *Molybdenum, Byproducts, Water pollution control, Mining.
Identifiers: Nonferrous metals, Industry, Smelting, Refining, *Silver, Tungsten.

The trend in the primary aluminum industry is toward reduced or zero discharge of waste water from both alumina refineries and aluminum smelters. The principal treatment needs of the aluminum industry relate to common types of industrial waste water such as cooling tower blow-down and neutralization products, and the specialized need to remove or recover fluoride ion components from fume scrubbers at smelters. The primary mercury industry, by virtue of a current air pollution control problems, may require increased measures of water pollution control associated with air emission control equipment or new processing methods. The primary molybdenum industry, consisting of a small number of operations other than those associated with the copper industry, has taken or is designing effective methods of water pollution control ranging from isolated water systems to changes in flotation reagent concentrations. Plants processing refractory metal concentrates to end products generally are associated with municipal water systems and show high materials recoveries with concurrent close control and careful segregation of waste water streams. Neutralization with filtration of acid wastes is a common practice of the plants surveyed. The small amount of information available for the primary gold and silver industries shows greatly differing practices, ranging from zero discharge in arid climates to problems with mercury and cyanide contents in waste waters. (See also W74-05116) (EPA)
W74-05117

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
R. D. Nelson, and E. Vey.
Available from NTIS, Springfield, Va. 22151, PB-224 820, Price $4.25 printed copy; $1.45 microfiche. Environmental Protection Agency Office of Solid Waste Management Programs Publication SW-530-56d, 1973. 108 p, 25 fig, 16 tab, 25 ref, 1 append.

Descriptors: *Water softening, *Sludge disposal, *Calcium carbonate, *Illinois, *Water reuse, Filtration, Drying, *Water treatment, Waste disposal, Sands, Solid wastes, *Dewatering.
Identifiers: Water softening sludge, Sludge reuse.

Methods for dewatering a water softening sludge from the village of Park Forest, Illinois, were studied. Uses for the dewatered sludge or ways in which it can be disposed of were evaluated. The initial concentration of the sludge is between 3.6% and 3.9% solids by weight. The sludge solids contain about 84% calcium carbonate, 11% magnesium hydroxide, and 5% miscellaneous and have 90% of the particles in the 1.5 to 30 micron range. The sludge is suitable for use as a mineral filler in paints, floor coverings, caulking compounds, and bituminous products. It can be mixed with sands, clays, and organic soils to improve their workability and strength characteristics. It can also be used as an agricultural liming material to improve workability and fertility of soils. If required, it can be used as a filler in concrete without adversely affecting strength and shrinkage characteristics. The best method of dewatering the sludge is vacuum filtration after gravity thickening. This dewatering method will produce a filter cake of about 45% solids and an almost clear filtrate which can be returned to the plant. (Knapp-USGS)
W74-05127

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
Copy available from GPO Sup Doc as EP1.16:13030 ELY5/71-6, $0.50; microfiche from NTIS as PB 215 417 $1.45. Water Pollution Control Research Series, May 1971. 30 p, 6 fig, 2 tab, 6 ref. EPA Project 13030 ELY5/71-6. Contract 14-06-200-3389A.

Descriptors: *Waste water treatment, Nitrogen, *Farm wastes, *Water Pollution Control, Biological treatment, Nitrates, Treatment facilities, *Tile drainage, Denitrification, Algae, Algal control, Bacteria, Filtration, Desalination.
Identifiers: *Algal growth, Algal harvesting, *Bacterial denitrification, *Nitrogen removal, Algal stripping.

Studies by an interagency group have shown that it is technically feasible to reduce 20 mg/l nitrate-nitrogen in agricultural tile drainage to 2-5 mg/l by either algae stripping or bacterial denitrification. Conditions necessary for maximum algal growth

included 8- to 12-inch pond depth, addition of small amounts of nutrients (CO_2, Fe, and P), up to four hours of daily mixing and detention times of from 5 to 16 days, depending on the season. The algae were harvested by coagulation-sedimentation followed by vacuum filtration. Bacterial denitrification was tested in anaerobic deep ponds and filters using methanol as a carbon source. Required detention times were on the order of 8 to 50 days for covered ponds (uncovered ponds were not suitable) and 1 to 2 hours for filters. During long-term operation of the filters periodic flushing was required to remove accumulated bacterial biomass. Preliminary cost estimates were $90 and $135 per million gallons for bacterial denitrification (either pond or filter) and algae stripping respectively. Laboratory studies indicated that nitrogen removal effectively lowered the biostimulatory nature of the waste with respect to algal growth in potential receiving waters. Two desalination processes were also studied--electrodialysis and reverse osmosos. Both processes effectively reduced total dissolved solids but neither removed boron, or reduced nitrate to the desired level. (EPA)
W74-05228

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
Broome County Sewer Agency, Broome County, New York, June 1969. 17 p, 1 fig, 5 tab.

Descriptors: *Sewerage, *Long-term planning, *Sewage disposal, *Regional development, *Wastewater treatment, *New York, Capital costs, Planning.
Identifiers: *Broome County(New York), Service costs.

For many years Broome County has relied on its major streams, the Susquehanna and Chenango Rivers, for the disposal of untreated and partly treated sewage from its urban core. Suburban areas within the urban core and the Villages of Lisle, Whitney Point, Windsor and Deposit and the developing Harpursville area in Colesville have relied upon individual disposal systems consisting of septic tanks and tile drainage fields for this purpose. The discharge of partly treated sewage has resulted in the gross pollution of streams. As the areas served by septic tanks and tile drainage fields have become more densely developed, increasing numbers of failures have been observed resulting in the overflow of septic tank effluent to the ground surface or to small water courses. These conditions should no longer be tolerated. Estimates made for this report indicate the County population should grow from about 230,000 at present to about 410,000 in 2020. The necessary growth in industrial and commercial facilities requires the extension of sewers to the developing areas that are contiguous to the older population centers in the urban core. Sewer extensions within the next few years should provide service to areas in Chenango, Conklin, Dickinson, Fenton, Kirkwood, Union and Vestal. About 1990, sewer extensions should be required into the Town of Maine. In addition to the urban core, population densities in the Villages of Deposit, Lisle, Whitney Point and Windsor now justify the construction of communal sewers. The Harpursville area in the Town of Colesville should develop to the point where sewers should be justified about 1980. (Poertner)
W74-05233

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Bacon and Thomas, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05235

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
Mid-Missouri Regional Planning Commission, Jefferson City, Missouri, 1972. 269 p, 80 fig, 6 tab. FHA Grant.

Descriptors: *Planning, *Water supply, *Sewerage, *Regional development, Municipal water, Sewers, Sewage treatment, Water demand, Water resources development.

A plan was prepared to serve as a coordinated guide for the development of water and sewer service to citizens of the Mid-Missouri Region. It is primarily directed to the rural areas and those communities having a population of less than 5,500 persons. The plan provides information on existing water and sewer systems and recommendations for additional systems needed in future years. The plan covers many counties in mid-Missouri the land area of which is predominately rural. The largest urban communities included are Jefferson City, Columbia, Fulton, Mexico, Centralia, Fayette, Booneville, Glasgow, Tipton, California, and Vandalia. A four-step planning process was used in the development of sewer system plan recommendations. This involved inventory of systems, population forecasts, identifying deficiencies, and analysis of the foregoing. General recommendations in both map and text form are given for each community in the region. The water system plan is divided into two related sections. The first concerns public water supply districts while the second concerns municipal water supply systems. Planning the water systems involved making an inventory of existing systems, applying general standards against the existing systems and population projections, and analysis of the foregoing. There are thirty public water supply districts in the mid-Missouri Region. They vary in size and serve rural areas having from 70 customers to more than 1,000 users. The total population served in 1972 was about 26,000 persons. (Poertner)
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
Coastal Area Planning and Development Commission, Brunswick, Georgia, May 1973. 215 p, 100 fig, 8 tab. HUD grant CPA-GA-04-04-1002.

Descriptors: *Regional analysis, *Water supply, *Sewerage, *Long-term planning, *Capital costs, *Georgia, Regional development, Future planning, Water resources development, Municipal water, Sewers, Sewage treatment, Industrial wastes, Atlantic coastal plain, Water demand, Waste disposal wells.
Identifiers: *Capital improvement program.

A review and updating of water and sewer studies made previously by the Coastal Area Planning and Development Commission is presented. Included is a summary of improvements proposed in reports of engineering studies. Priorities, projected programs, cost estimates and financing recommendations are given for meeting water supply and sewage disposal needs through 1990. Population and economic trends for the region are discussed. These statistics indicate that in other than the major municipalities and their suburbs, growth will be slow. For this reason, programs in the rural areas are largely limited to solving existing public health problems related to improper individual water supply and sewage disposal facilities. The most severe problems facing the major municipalities in the study area are the deterioration of the quality of the water supply brought on by concentration of industrial wells in relatively small areas and the inadequacy of sewerage facilities. The population growth in unincorporated areas around the major municipalities has also resulted in an urgent need for public water and sewer service. (Poertner)
W74-05242

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
Saginaw County Metropolitan Planning Commission, Saginaw, Michigan, May 1971. 245 p, 26 fig, 4 tab, 4 appendices. HUD Mich. P-299 (G).

Descriptors: *Planning, *Water supply, *Sewerage, *Waste water disposal, *Michigan, Municipal water, Water demand, Water resources development, Long-term planning, Storm drains, Capital costs.
Identifiers: *Saginaw County(Michigan).

Guidelines were prepared in the form of an engineering-planning report for use in the formal adoption of the water and wastewater utilities element of the County Development Plan. The report investigates the present status of the County's existing water and wastewater utilities and proposes county-wide water and wastewater utility master plans to the year 1990. Summaries are presented for projects currently under construction and cost estimates of proposed improvements, required to implement the master plans during the short and long range planning periods, are included. Background information is given concerning the County's planning goals and policies, population history and projections, natural physical characteristics, water resources, conservation of the water resources, water and wastewater treatment and preliminary information on storm water drainage problems. (Poertner)
W74-05243

TREATMENT FOR CLARIFYING WHITE WATER COMING FROM A GROUNDWOOD PULP MILL (TRATAMIENTO PARA LA CLARIFICACION DE AGUA BLANCA PROCEDENTE DE LA FABRICACION DE PASTA DE MADERA),
F. Kohn Cornejo.
ATCP (Association Mexicana de Technicos de las Industrias de la Celulosa y del Papel), Vol 13, No 1, p 17-20, Jan/Feb 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Pulp wastes, *Mexico, *Flocculation, *Coagulation, *Waste water treatment, Operating costs, Cost-benefit ratio, *Water reuse, Recirculated water, Additives, Pulp and paper industry, Slime, Electrolytes, Aluminum, Silica, Industrial water.
Identifiers: *White water, Groundwood mills, Mechanical pulping, Clarifiers, Flocculants, Coagulants, Polyelectrolytes, Alum(Aluminum-potassium sulfate), Aluminum compounds, Activated silica, Chemical consumption.

White water from the grinder room of a groundwood (mechanical pulp) mill was purified in a clarifier basin with addition of flocculants, notably alum, activated silica, and polyelectrolyte. The treated water was found suitable for reuse as process water in a paper mill without requiring microbicidal or algaecidal additives for slime control. The treatment cost slightly over 20 cents per cu m of clarified water. (Speckhard-IPC)
W74-05245

WASTE WATER TREATMENT: USING PURE OXYGEN FOR SECONDARY TREATMENT,
Union Carbide Corp., Tonawanda, N.Y.
L. C. Matsch, and W. C. Dedeke.
Complete M/S (21 p) available from A.I.Ch.E. Publications Dept., New York, N.Y. 10017. Cost $5.00. Chemical Engineering Progress, Vol 69, No 8, p 75-76, Aug 1973.

Descriptors: *Waste water treatment, *Oxidation, *Oxygen, *Pulp wastes, *Aeration, Suspended solids, Sludge, Sedimentation, Settling velocity, Sedimentation rates, Pilot plants, *Virginia, Pulp and paper industry, Dewatering.

The 'Unox' oxygen treatment system of Union Carbide Corp. is said to offer several advantages over the use of air for effluent aeration treatments. Among them are the ability to operate at higher concentrations of mixed liquor suspended solids, faster sludge settling rates, more concentrated underflows, a lesser amount of excess solids generation, superior dewatering ability of the sludge, and better resistance to occasional process shocks. Results are given of pilot plant trials at the West Point, Virginia, pulp mill of Chesapeake Corp. of Virginia. (Hansen-IPC)
W74-05247

A STARCH-FREE EFFLUENT PROGRAM FOR CORRUGATING PLANTS,
Canada Starch Co. Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5B.
W74-05250

RADIATION OXIDATION OF WATER ADMIXTURES IN WATER-CONTAINING HUMAN WASTES (IN RUSSIAN),
N. V. Bychkov, A. N. Kasperovich, V. V. Krasnoshchekov, V. P. Plotnikova, and Yu. E. Sinyak.
Kosm Biol Med, Vol 6, No 6, p 44-47, 1972, English summary.
Identifiers: Admixtures, Human wastes, *Oxidation, *Radiation, *Water purification, *Waste water treatment, Toxicity.

The radiation method for purifying water-containing human wastes from organic admixtures in the presence of hydrogen peroxide was developed. The effect of radiation dosages on the oxidation of organic admixtures was studied. The toxicological evaluation of regenerated water was performed.--Copyright 1973, Biological Abstracts, Inc.
W74-05252

METHANOL DISTRIBUTION IN AN EVAPORATION PLANT,
Billeruds A.B., Saffle (Sweden).
H. G. I. Arne, and S. Bergkvist.
Svensk Papperstidning, Vol 76, No 10, p 380-382, June 17, 1973. 2 fig, 2 tab, 4 ref.

Descriptors: Water pollution sources, *Pulp wastes, *Alcohols, *Biochemical oxygen demand, Water reuse, *Waste water treatment, Industrial wastes, *Evaporators, *Condensation, Pulp and paper industry, Treatment facilities, Steam, Heat exchangers, Waste disposal.
Identifiers: Kraft pulp mills, Scandinavia, Condensates, Black liquors, Methanol(Or Methyl alcohol).

Condensates from the evaporators of modern kraft mills are usually collected into a single stream from which a portion is withdrawn for reuse in other mill departments while the remainder is sewered and contributes to the BOD load of the receiving stream, mainly due to methanol being present. The distribution of methanol in various streams of a Scandinavian evaporation plant was calculated, using general distillation rules, and the results were verified experimentally. They showed that, for the customary III-IV-V-I-II sequence of liquor feeds, the condensates from the first surface condenser and from effects II and III (including the liquor preheaters) contain only small amounts of methanol and can thus be sewered to make room for the reuse of effect IV and V condensates which contain the main portion of methanol. Because of their small volume and high methanol concentration, condensates from liquor preheater IV and from the second surface condenser can be treated by steam stripping, using the Uddeholm system. The accumulation of methanol to be expected from condensate reuse may be reduced by increasing the steam vent from effect V and by providing it with an extra heat exchanger. Overall results of calculations and experiments indicate that a considerable reduction of condensate-caused water pollution is feasible. (Brown-IPC)
W74-05253

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
D. C. Morris.
Journal Water Pollution Control Federation, Vol 45, No 9, p 1939-1945, Sept. 1973. 5 fig, 3 ref.

Descriptors: Recirculated water, *Reverse osmosis, *Recycling, *Waste water treatment, *Pulp wastes, *Water reuse, Water conservation, *Corrosion, Maintenance, Operation and maintenance, *Wisconsin, Pulp and paper industry, Sulfite liquors, Water vapor, Humidity, Water circulation.
Identifiers: Sulfite pulp mills, NSSC(Neutral sulfite semichemical) pulping, Spent sulfite liquors, Board mills, Paper machines, Exhaust hoods.

A reverse osmosis process was installed at the NSSC (neutral sulfite semichemical) pulp and paperboard mill of Green Bay Packaging Inc. at Green Bay, Wisconsin, to concentrate dilute waste waters so that they could be mixed with stronger wastes before final treatment. Because reverse osmosis is expensive, substantial in-house recycling was practiced to reduce the volume of dilute wastes to be treated. The recycling procedure caused higher mill temperatures and humidities and shortened the service life of equipment through corrosion by the greater concentration of chemicals dissolved in circulating vapors and liquids. A hood had to be installed over the paper machine to protect the hall's roof from condensation droplets. Equipment maintenance also increased accordingly. (Witt-IPC)
W74-05254

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
A. Stiebert.
Melliand Textilberichte, Vol 54, No 8, p 864-870, Aug. 1973. 3 ref.

Descriptors: *Textiles, *Water pollution sources, *Industrial wastes, *Waste water treatment, Water conservation, *Recycling, Economic efficiency, *Water reuse, Water purification, Dyes, Dye concentrations, Education, Manpower, Training, Costs, Biological treatment, Disinfection, Water softening, Corrosion, Sludge disposal, Organic loading.
Identifiers: Textile finishing, Mercerization.

Ground waters (well waters) and surface waters for use in textile finishing operations may require various pretreatments for removal of hardness, algae, coliform bacteria, and corrosive components. Waste water problems of the textile finishing industry involve mainly dyes, fixatives, the recovery of mercerizing liquors, sludge disposal, and general economic decisions. Several practical solutions to these problems are discussed. Outside consultants are not the sole answer, since local conditions influence results. Education and training of factory workers are essential to the success of any treatment installation. Water conservation through recycling is gaining in importance. A comparison of costs for different water purification processes indicates that biological effluent treatments are both difficult and costly. It is proposed to treat effluents containing strong organic loadings separately and to pass them to a municipal installation for biological processing. (Brown-IPC)
W74-05255

EFFLUENT -- FIBRE RECOVERY -- WATER SAVINGS: A METHOD TO ANALYSE AND TACKLE THE PROBLEMS,
K. D. Blundell.
Paper (London), Vol 179, No 3, p 118, 120-122, Feb. 7, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pollution abatement, Water conservation, *Pulp wastes, *Pulp and paper industry, *Treatment facilities, Equipment, Biochemical oxygen demand, Suspended solids, Color, Cooling, Thermal pollution, Sludge treatment, Sludge disposal, Dewatering, Effluents, Waste treatment, Water pollution treatment.
Identifiers: Paper mills, Board mills, Savealls, Fiber recovery, Concentrating(Dewatering).

A broad outline is given of a systematic approach to the solution of effluent disposal, fiber recovery, and water conservation problems in paper and paperboard mills. Types of available equipment are described for dealing with fluctuating effluent volumes, for reducing the BOD and solids content of effluents, cooling thermal discharges, removing color bodies, and for concentrating and disposing of sludges. Guidelines to the selection of the most suitable facilities for specific conditions are also given, along with a list of available fiber-recovery units or savealls. (Witt-IPC)
W74-05257

QUICK BROWN FOX DOESN'T TRIP OVER THILMANY'S EFFLUENT ANYMORE,
M. MacLeod.
Paper Trade Journal, Vol 157, No 20, p 36-40, May 14, 1973. 4 fig.

Descriptors: *Treatment facilities, *Pulp wastes, *Wisconsin, *Pulp and paper industry, *Water conservation, Economic impact, Water reuse, Effluents, Pollution abatement, *Waste water treatment, Industrial wastes, Costs, Capital costs.
Identifiers: Kraft mills.

Thilmany Pulp and Paper Co., a division of Hammermill Paper Co., operates an integrated kraft pulp and paper mill and converting plant at Kaukauna, Wisconsin, on the lower Fox River. An environmental improvement program costing ca. $2.4 million was successfully financed via a municipal revenue bond issue and was recently completed to supplement existing treatment facilities. The installation comprises both external and internal effluent treatment measures. Internal water conservation measures include an extended white water collection system, high-pressure machine cleaning showers, reuse of decontaminated evaporator condenser water, and fiber-recovery savealls. The external treatment of 23 million gal/day of waste water involves an 186-ft diameter clarifier basin designed to remove 75% of suspended solids and 50% of 5-day BOD, a centrifugal sludge dewatering system employing pressure filters, and two biological oxidation lagoons of 30 million gal capacity each. A flowchart of the entire system, including auxiliary equipment, is included. (Witt-IPC)
W74-05258

THE PURIFICATION OF RESIDUAL WASTE WATERS OF THE SULFITE PULP INDUSTRY (DIE REINIGUNG VON RESTABWAESSERN DER SULFITZELLSTOFF-INDUSTRIE),
Cellulose Attisholz A.G., Luterbach (Switzerland).
A. Scherler.
Das Papier, Vol 26, No 10A, p 637-642, Oct. 1972. 8 fig, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Bleaching wastes, *Sulfite liquors, Pulp and paper industry, Biological treatment, Capital costs, Operating costs, Costs, Economic efficiency, Biochemical oxygen demand, Chemical oxygen demand, Europe, Waste treatment, Ef-

fluents, Water pollution sources, Eutrophication, Treatment facilities.
Identifiers: *Switzerland, Attisholz process, Bentonite process, Evaporation condensates, Bleach plants, Sulfite pulp mills, Spent sulfite liquors, Ammonium base sulfite process, Acid sulfite pulping.

With exception of ammonium-base spent sulfite liquor, which may contribute to water eutrophication, the effluents generated by various acid sulfite pulping processes do not differ sufficiently in water pollution loads to warrant switching from one to another for environmental protection only. The biological treatment of sulfite mill effluents, especially the problems posed by evaporator condensates and bleach plant waste waters, are discussed, with emphasis on the Attisholz process. Among nonbiological treatment processes, which are increasing in popularity, the Bentonite process used at a Swiss sulfite pulp mill is of special interest. Assuming that 97% of all effluents are subjected to combined mechanochemical plus biological treatment, one can expect a reduction in 5-day BOD to 9-10 kg per 100 kg of oven-dry pulp produced. The achievable degree of purification is somewhat less for softwood-derived than for hardwood-derived sulfite mill effluents. Typical COD and BOD balances are illustrated. A two-stage biological treatment plant designed for a hydraulic load of 2500 cu m/hr and a 5-day BOD loading of 18 t/day would require an investment of 12.6 million Swiss francs. Operating costs are estimated at 2.35 million francs. Together with interest charges of 1.2 million francs, the total cost for waste water purification runs to 0.158 francs/cu m. (Wise-IPC)
W74-05260

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht.
Das Papier, Vol 26, No 10A, p 625-628, Oct. 1972. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Pulp and paper industry, *Biological treatment, Waste water(Pollution), Water pollution sources, Organic loading, Biochemical oxygen demand, Effluents, Industrial wastes, *Pollution abatement, Sludge disposal, Europe, Waste treatment, Regulation, Legislation, Governments.
Identifiers: Paper mills, Pulp mills, Sulfite pulp mills, White water, Germany, Switzerland.

Increasingly strict government regulations for water quality control in Germany will force pulp and paper mills to add secondary (biological or nonbiological) treatment facilities to their primary mechanical-chemical effluent purification installations, so as to remove organic pollutants in addition to suspended solids. The major effluent treatment methods available to the pulp and paper industry are listed, and disposal of the resulting sludge is also mentioned. Differences in the characteristics of paper vs. pulp mill wastes are pointed out, as they affect the selection of an adequate treatment sequence. Thus, residual paper mill white water contributes only about 6 kg of 5-day BOD per ton of paper to the pollution load, compared to 50 kg of oxygen per ton of sulfite pulp produced. The former load is equivalent to the sewage generated daily by 80 people, the latter equivalent to that produced by a population of 750. Several Swiss sulfite mills had to shut down for environmental protection reasons. (Wise-IPC)
W74-05261

BIOLOGICAL AND NONBIOLOGICAL PROCESSES FOR REMOVING DISSOLVED ORGANIC SUBSTANCES FROM RESIDUAL WASTE WATERS (BIOLOGISCHE UND NICHTBIOLOGISCHE VERFAHREN ZUR ENTFERNUNG GELOESTER ORGANISCHER SUBSTANZEN AUS RESTABWAESSERN),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H-L. Dalpke.
Das Papier, Vol 26, No 10A, p 631-635 (discussion p 635-637), Oct. 1972. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Organic wastes, Pulp and paper industry, *Aerated lagoons, *Activated sludge, *Biological treatment, Filtration, Filters, *Trickling filters, Biodegradation, Oxidation, Adsorption, Incineration, Electrolysis, Electrodialysis, Flotation, Catalysts, Reverse osmosis, Chemical precipitation, Radiation, Ion exchange, Evaporation, Freeze drying, Ion transport, Organic loading, Dissolved solids, Effluents.
Identifiers: Concentrating(Thickening), Wet combustion(Chemical oxidation), Electroflotation.

Three types of biological effluent treatment processes are distinguished: (1) Aerated stabilization ponds merely accelerate natural bio-oxidative degradation of pollutants. (2) Single- and multistage activated sludge processes can operate with surface aeration or pressure aeration. (3) Fixed biological substrates, such as trickling filters, have been used commercially, but generally less effectively than activated sludge methods, of which a great variety are possible. Among nonbiological processes outlined are (1) adsorption (on activated carbon, flyash, sludge-derived coke, or synthetic adsorbents); (2) catalytic oxidation; (3) wet combustion (at high or low pressure); (4) direct-current treatments (electroflotation, electrodialysis, and electrolysis); (5) chemical precipitation (with or without chemical recovery); (6) reverse osmosis; (7) ion-exchange; (8) gamma-irradiation; (9) thickening or concentrating (by evaporation or freeze drying). The relative merits of these (largely still experimental) nonbiological methods are pointed out, with special regard to their applicability in the pulp and paper industry. (Wise-IPC)
W74-05262

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
G. Strittmatter.
Das Papier, Vol 26, No 10A, p 649-654 (discussion p 654-657), Oct. 1972. 8 fig, 3 ref. English summary.

Descriptors: *Sludge treatment, Sludge disposal, *Waste water treatment, *Pulp wastes, *Dewatering, *Drying, *Byproducts, *Incineration, Fertilizers, Recycling, Solid wastes, Humus, Fibers(Plant), Fuels, Filters, Filtration, Centrifugation, Treatment facilities, Equipment, Sedimentation, Settling basins, Separation techniques, Industrial wastes.
Identifiers: Composting, Vacuum filters, Presses, Screw presses, Filter presses, Belt filters, Boards, Board mills, Insulation boards, Panel boards, Paperboards, Building boards, Fiberboards, White water.

All pulp and paper mill waste water treatments produce fibrous sludge, regardless of whether they use chemical, mechanical, biological, or combined processes. Since the dry solids content of sludges ranges from 1 to 8%, economical handling methods require thickening (concentrating), dewatering, and drying steps prior to disposal or reuse. Equipment and techniques available for these processing steps are reviewed and illustrated, notably decanters, skimmers, centrifuges of various kinds, hydrostatic and vacuum filters, and filter, belt, and screw presses. While the solids-liquid separation technology has made significant strides, problems of satisfactory sludge disposal still await adequate solutions. Among reported commercial possibilities of sludge reuse are composting (to humus), combustion (as fuel), and resale to mills making paperboards, panel boards, insulation boards, and flame-retardant building boards. (Wise-IPC)
W74-05263

INSTALLATION OF WASTE WATER AND SLUDGE TREATMENT FACILITIES AT THE ARJOMARI-PRIOUX PAPER MILL AT RIVES-SUR-FURE (INSTALLATION DE TRAITEMENT DES EAUX RESIDUAIRES ET DES BOUES DE LA PAPETERIE ARJOMARI PRIOUX A RIVES-SUR-FURE).
Papier, Carton, Cellulose, Vol 22, No 1-2, p 40-43, January-February 1973. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Pulp wastes, Europe, *Flocculation, *Coagulation, *Sludge treatment, Pulp and paper industry, Operating costs.
Identifiers: Sedimat flocculator, Clarifiers, *France.

Automated waste water and sludge treatment facilities at a French paper mill are described. They center around a 'Sedimat' flocculator-clarifier which permits sludge recirculation. Chemical (coagulant) consumption and operating experiences are reported. (Speckhard-IPC)
W74-05264

WHITHER CLARIFIED SLUDGE. (WOHIN MIT DEM KLAERSCHLAMM.),
For primary bibliographic entry see Field 5E.
W74-05266

PURIFICATION OF BLEACHED KRAFT MILL EFFLUENTS BY ACTIVATED SLUDGE TREATMENT (OCZYSZCZANIE METODA OSADU CZYNNEGO SCIEKOW Z PRODUKCJI MASY CELULOZOWEJ SIARCZANOWEJ BIELONEJ),
Z. Skwara, K. Lelonkiewicz, and C. Leszczynski.
Przeglad Papierniczy, Vol 29, No 5, p 178-183, May 1973. 2 tab, 2 fig, 23 ref. English summary.

Descriptors: *Activated sludge, *Biological treatment, *Pulp wastes, *Bleaching wastes, *Waste water treatment, *Aeration, Evaporation, Biochemical oxygen demand, Settling basins, Nutrients, Phosphates, Sulfates, Ammonium salts, Organic loading, Suspended solids, Europe, Pulp and paper industry, Laboratory tests.
Identifiers: Kraft mills, *Poland, Condensates, Evaporator condensates, Black liquors, White water.

Two kinds of effluents from the Kostrzyn kraft mill (Poland) were subjected to laboratory treatments with activated sludge to study the effects of aeration time, BOD loading, and proportion of evaporator condensates. Both effluents contained ca. 100 mg oxygen per liter. One stream came from the digester room, pulp washing and screening, bleaching, and the pulp-drying machine ('wet machine'). It was mixed in 4:1 and 2:1 ratios with the other stream coming from the soda recovery boiler, black liquor evaporator, causticizer, and sulfate soap acidulation plant. After 1-hr sedimentation of suspended solids, both mixtures were aerated in 4 different tanks with addition of ammonium sulfate and potassium dihydrogen phosphate in the nitrogen to phosphorus ratio 2.5:0.5 per 100 parts of 5-day BOD, and with pH adjusted to 7.5. Activated sludge from secondary settling tanks was recycled to the continuously fed aeration tanks (8 liter capacity each). The BOD load was kept at 0.1 or 0.13-0.15 g per g of sludge per day. BOD reductions observed were 77% after 4 days and 90% after 7 days, using relatively low sludge concentrations (1-2 kg/cu m). Increasing the proportion of evaporator condensates in the effluent reduced the BOD removal to 87.3%. (Stapinski-IPC)
W74-05267

HOW MUCH WILL CLEANUP COST,
F. G. Hurtubise, D. Jones, and H. D. Paavila.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 48, 50, Sept. 1973.

Descriptors: *Economic impact, *Treatment facilities, *Pulp and paper industry, *Canada, *Pollution abatement, *Costs, Capital costs, Operating costs, Water reuse, Water consumption(Excluding consumptive use), Legislation, Regulation, Water quality standards, Water quality control, Waste water treatment.

Under regional antipollution regulations, the Canadian pulp and paper industry spent $195 million in 1960-1971 on water pollution abatement, viz., $130 million for in-plant improvements and $65 million on external treatment facilities. These measures reduced effluent BOD by 33%, water use by 19%, and suspended solids by 72% per ton of product. The 1971 federal water quality standards will require additional investments of $9,700 capital plus $3.91 operating cost per daily ton produced. Meeting the program's goal will cost the Canadian industry over $500 million. Data from a survey of various mills are included to support these estimates. (Brown-IPC)
W74-05268

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
Pulp and Paper, Vol 47, No 4, p 112-113, April 1973. 2 illus.

Descriptors: Treatment facilities, *Pulp wastes, *Pipelines, *Plastics, *Bleaching wastes, *Waste water treatment, Industrial wastes, *Construction materials, Steel, *Oregon, Pulp and paper industry, Aerated lagoons, Corrosion.
Identifiers: Polyethylene, Willamette River(Oregon), Materials handling.

At the pulp and paper mill of Boise Cascade Corp. at Salem, Oregon, a high-density polyethylene pipeline was installed to convey effluents to an aeration pond for secondary treatment prior to discharge into the Willamette River. The pipeline carries a mixture of spent sulfite cooking liquor, bleach plant effluent, evaporator condensate, and paper mill white water. Resistance to corrosive liquids and ease of installation on land and under water are the major advantages of polyethylene over conventional wrapped or coated steel pipe. (Witt-IPC)
W74-05269

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
T. W. Beak.
Pulp and Paper Magazine of Canada, Vol 74, No 11, p 25-26, 28-29, Nov 1973. 1 illus.

Descriptors: *Pollution abatement, *Pulp and paper industry, *United States, *Canada, Attitudes, Psychological aspects, *Social aspects, *Environmental control, Regulation, Legislation, Water quality standards, Governments.
Identifiers: Public relations, Cooperation.

Changes in water pollution by the Canadian pulp and paper industry and in abatement technology, economics, and attitudes from the 1950's to the present are discussed. Lessons to be learned from past over- and underreactions to environmental problems in North America are emphasized. The importance of good clean housekeeping practices is illustrated, along with the need to look beyond in-plant control measures. The paper industry must regain public confidence that it can and does operate without disrupting the environment. Cooperation with the proper authorities should convince the latter that their insistence on nationwide uniform effluent standards is not the answer to local situations. The vital function of professional consultants and service industries in fostering sound, objective attitudes is keynoted. (Brown-IPC)
W74-05272

MEASURES AGAINST WATER POLLUTION IN MECHANICAL PULP AND PAPER MILLS,
Stora Kopparbergs Bergslags A.B., Kvarnsveden (Sweden). Kvarnsvedens Pappersbruk.
A. Wichman.
Pure and Applied Chemistry, Vol 29, p 291-298, 1972. 2 fig, 3 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Europe, Pulp and paper industry, Flotation, Flocculation, Sedimentation, Research priorities, *Pollution abatement.
Identifiers: *Sweden(Kvarnsveden), Newsprint mills, Groundwood mills.

A description is given of water pollution control measures taken at the groundwood and newsprint mill of Stora Kopparberg Bergslags AB. in Kvarnsveden, Sweden. The need for further fundamental data on the mechanisms of flotation, flocculation, and sedimentation processes is emphasized. An appeal is made for cooperative research by all parties interested in water pollution abatement and environmental protection. (Buchanan-IPC)
W74-05273

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
J. E. Leker, and W. C. Parsons.
Southern Pulp and Paper Manufacturer, Vol 36, No 1, p 32-34, Jan 10, 1973. 4 fig, 10 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Recycling, *Water quality control, *Recirculated water, *Mississippi, Pulp and paper industry, Effluents, Water reuse, Reclaimed water, Evaporation, Evaporators, Suspended solids, Byproducts, Biological treatment, Aerated lagoons, Sludge treatment, Incineration, Sludge disposal, Discharge(Water), Sedimentation, Settling basins.

Difficulties of finding simple solutions to meeting antipollution water quality standards are discussed in the context of waste water treatment measures taken at Masonite Corp.'s pulp and board mill in Laurel, Mississippi, where a facility was designed for treating 7 million gal of effluent per day according to standards existing in 1970. An initial survey showed that the mill produced daily 257,000 lb of BOD and 40,000 lb of suspended solids. About 90% of the BOD was contained in the wash water from steam-processed pulp which amounted to less than 15% of the total waste water flow. This stream of wash water is concentrated in a quintuple-effect evaporator. Residual solids are converted into a marketable product. Two other effluent streams (process water plus cooling, sealing, and housekeeping waters) are handled separately in primary clarifiers from which 90% of treated water is recycled to the mill, the remainder being diluted with the second stream and treated in a biological contact-stabilization system. Overflows pass to a 10-acre aerated lagoon for polishing before reuse or discharge. Sedimented solids from the primary treatment are burned, disposed of as landfill, or utilized in other industries. An unsolved problem is the disposal of 20 t/day of excess biological sludge which is difficult to dewater. (Hansen-IPC)
W74-05274

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
H. W. Rapson, and D. W. Reeve.
Tappi, Vol 56, No 9, p 112-115, Sept. 1973. 2 fig, 25 ref.

Descriptors: Water conservation, *Water reuse, *Pulp and paper industry, *Bleaching wastes, *Pulp wastes, Effluents, *Waste water treatment, Chlorine, Equipment, Sodium sulfate, Evaporation, Sodium chloride, Waste water(Pollution), Water circulation, Reclaimed water, Recirculated water.
Identifiers: Wash water, Evaporator condensates, Bleach plants, Kraft mills, Chlorine dioxide, Spent liquors, R-3 chlorine dioxide bleaching process, Pulp washing, Countercurrent processes, White liquors, Chemical recovery.

All aqueous effluents from bleached kraft pulp mills can be eliminated by recoverying and reusing all the water and chemicals required for bleaching. None of the process changes that would be involved are radical departures from existing technology, and none of the equipment needs are novel. Pulp can be washed completely countercurrently, from the last washer in the bleach plant to the first brown stock washer. A substantial portion of chlorine in the chlorination stage can be substituted by chlorine dioxide. Evaporator condensates can be steam- and air-stripped and reused to wash the bleached pulp. Salt (NaCl) is recoverable from the spent bleach liquor by evaporation of the white liquor and may be used to regenerate bleaching chemicals. All the chlorine and chlorine dioxide needed for bleaching, as well as the sodium sulfate used as cooking liquor makeup, are presently producible in the so-called 'R-3' process by the chlorine dioxide generator-evaporator-crystallizer. The design and development status of effluent-free kraft mills is discussed in the light of these possibilities. (Brown-IPC)
W74-05275

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
I. K. Bansal, and A. J. Wiley.
Tappi, Vol 56, No 10, p 112-115, Oct 1973. 3 fig, 9 ref, 4 tab.

Descriptors: *Reverse osmosis, *Waste water treatment, *Pulp wastes, *Optimization, *Mathematical models, *Simulation analysis, *Cost analysis, Cost-benefit analysis, Operating costs, Capital costs, Effluents, Maintenance, Osmotic pressure, Flow, Depreciation, Design data, Water pollution treatment, Reclaimed water, Pulp and paper industry, Sodium chloride, Pipelines.
Identifiers: Concentrating(Dewatering), Flux rate, Salt rejection.

A computerized mathematical model was developed for the optimal design of large-scale reverse osmosis (R.O.) systems to be used for concentrating dilute effluents of the pulp and paper industry. The model calculates the number of modules needed and their best configuration by optimizing the capital and operating costs of a large multistage concentrating system. This model was found to be sensitive to the reference NaCl flux rate, the osmotic pressure of liquors being processed, module depreciation, module cost per square foot of membrane, and module maintenance cost. Agreement between experimental data and results obtained with the mathematical model was within 10%. For the design of a manifolding and piping system of R.O. units, the number of modules operated in series seemed to be more important than the number of stages and the recovery ratios of water in each stage. Probably, the equivalent of two 18-tube modules in series (250-300 total linear feet) is optimum for 1/2-inch inside-diameter tubular modules, based on present capital and operating costs of an R.O. concentrating system. (Brown-IPC)
W74-05276

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
C. Canty, F. G. Perry, Jr., and L. R. Woodland.
Tappi, Vol 56, No 9, p 52-55, Sept. 1973. 1 fig, 2 ref, 2 tab.

Descriptors: Cost-benefit ratio, Sulfite liquors, Pulp wastes, *Economic impact, *Pulp and paper industry, *Pollution abatement, *Regulation, *Treatment facilities, *Waste water treatment, Bleaching wastes, Water quality standards, Water quality control, Effluents, Capital costs, Operating costs, Legislation, Industrial wastes, Discharge(Water), Water pollution sources, Profit, Unemployment, Incinearation, Byproducts, Biological treatment, United States.
Identifiers: Sulfite pulp mills, Spent sulfite liquor, Spent pulping liquors, Chemical recovery.

The probable impact of antipollution legislation on the economies of U.S. sulfite pulp and paper mills is discussed. The most serious effluent problem is caused by spent sulfite pulping liquors. Three treatment methods are compared with regard to efficiency and costs, viz., biological process, by-product recovery, and incineration. Capital investments and operating costs for treatment of spent bleach plant liquors, for removal of suspended solids, and for air pollution control are also presented. Seven U.S. sulfite mills having a total production capacity of 400,000 tons/year may not be able to cope with regulatory water quality demands, and may close down by 1976. Four additional mills with 470,000 t/yr combined capacities are operating with marginal profitability. Although shutdowns may cause regional temporary unemployment, salutary effects should include improved product supply-demand balance and better water utilization with increased recovery of fibers, chemicals, and heat to help reduce the pollution abatement costs. Most mills will incur comparable expenses to meet water quality standards and should be able to remain competitive. (Brown-IPC)
W74-05277

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. O. Blosser, and I. Gellman.
Tappi, Vol 56, No 9, p 46-50, Sept. 1973. 3 tab, 7 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pollution abatement, *Waste water treatment, *Water pollution sources, Regulation, Pulp and paper industry, United States, Management, Decision making, Treatment facilities, Industrial wastes, Pennsylvania, Washington, Florida, Effluents, Waste water(Pollution).
Identifiers: Chemical recovery, Pulp mills, Sulfite pulp mills.

The sources, volumes, compositions, and other characteristics of effluents from sulfite pulp mills using Ca-, Mg-, Na-, or ammonia-base cooking liquors are reviewed. Trends in the adoption of various chemical recovery systems, installation of accompanying external effluent treatment facilities, and decisions on expansion vs. termination of sulfite mills in response to pollution control regulations are described. Case histories are presented to document the viability of various management decisions, notably the measures adopted at Charmin Paper Products Co. (Mehoopany, Pa.), Crown-Zellerbach Corp. (Camas, Wash.), ITT Rayonier Inc. (Fernandina Beach, Fla.), and Weyerhaeuser Co. (Cosmopolis, Wash.). (Brown-IPC)
W74-05278

HOT PROBLEM SOLVED BY AERATED LAGOON,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
C. E. Adams.
Water and Wastes Engineering, Vol 9, p E8-E11, Sept. 1972. 5 tab, 1 diag.

Descriptors: Cooling, *Cooling towers, *Aerated lagoons, *Waste water treatment, *Pulp wastes, Cost-benefit ratio, *Economic efficiency, Operating cost, Capital cost, *Thermal pollution, Effluents, Pulp and paper industry, Temperature, Lagoons, Biological treatment, Industrial wastes.

A computer program was developed for comparing the merits of an aerated lagoon with those of a cooling tower for the purpose of reducing the temperature of paper mill effluents to a level suitable for biological treatment. For the particular case studied, aeration proved to be more economical than a cooling tower. Aeration required more land, but this was offset by the initial cost of the tower. The deciding factor was the high operating cost for pumping the wastes to the tower. In regions where land is more expensive, cooling towers could be the more economical way of preventing thermal pollution. (Buchanan-IPC)
W74-05280

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
H. Widmer, and O. Widmer.
Wochenblatt fuer Papierfabrikation, Vol 100, No 23/24, p 930-932, Dec 15, 1972. 2 fig.

Descriptors: *Pulp and paper industry, Water conservation, *Recirculated water, *Water reuse, *Industrial water, *Waste water treatment, *Flotation, Discharge(Water), Effluents, Equipment, Treatment facilities, Pesticides, Additives, Slime, Microorganisms, Reclaimed water, Recycling.
Identifiers: *White water, Savealls, Paper machines, Board machines, Fourdrinier machines, Cylinder (Board) machines.

A completely closed water circulation system for paper and board machines is described, based on treatment of white water in flotation savealls with addition of a nontoxic slime-control additive. Experience with this system in two fourdrinier and two combined fourdrinier/cylinder machines for production of corrugating media, coated and uncoated paperboards, and packaging papers showed it to permit machine operation with a minimum of fresh water intake and practically no effluent discharge, without any adverse effects on product quality and production rate. (Speckhard-IPC)
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht, and H-L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 235-241, April 30, 1973. 1 fig, 32 ref.

Descriptors: *Water reuse, *Pulp and paper industry, Water circulation, *Water conservation, Waste water(Pollution), Water pollution sources, Pollution abatement, Discharge(Water), *Economic feasibility, *Reviews, *Recycling.
Identifiers: White water, Paper machines.

A critical review of literature reporting experience with the closing or partial closing of process water circulation systems in paper mills discusses the planning and engineering stages involved in circuit closure, its advantages for pollution abatement, and its disadvantages or problems. The applicability of this technique is presently still limited, but holds promise of minimizing the discharge of aqueous effluents. Total effluent elimination, e.g., by the development of 'dry' (pneumatic) and synthetic paper manufacturing processes, will not be able to fill the increasing demand for paper. (Speckhard-IPC)
W74-05282

EXPERIENCES WITH CHEMICAL PRE-PURIFICATION OF KRAFT MILL WASTE WATER WITH MAGNESIUM CHLORIDE BRINE (POTASSIUM EXTRACTION LIQUOR) (ERFAHRUNGEN BEI DER CHEMISCHEN VORREINIGUNG VON SULFATZELLSTOFFABWASSER MIT MAGNESIUMCHLORIDSOLE (KALIENDLAUGE),
VEB Zellstoff- und Papierkombinat Trebsen (East Germany).
K. Schmidt, and D. Schladebach.
Zellstoff und Papier, Vol 22, No 2, p 45-49, Feb. 1973. 9 fig, 4 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Coagulation, *Chemical precipitation, *Colloids, *Dissolved solids, Magnesium compounds, Chlorides, Lime, Sedimentation rates, Sludge, Chemical oxygen demand, Pulp and paper industry, Byproducts.
Identifiers: Magnesium chloride, Wash waters.

Magnesium chloride, which is available in large amounts as a by-product of the potassium industry, can be used to precipitate colloids and dissolved solids from pulp wash waters. Sedimentation can be improved by additions of quick lime or caustic sludge. Treatment of pulp waste waters with 1.4 g of magnesium chloride per liter of effluent was found to reduce the COD by ca. 30%. (Ward-IPC)
W74-05283

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
G. G. Allan, C. S. Chopra, R. I. Gara, A. N. Neogi, and R. M. Wilkins.
Available from the National Technical Information Service as PB-222 051, $4.85 in paper copy, $1.45 in microfiche. Environmental Protection Agency report EPA 670/2-73-034, July, 1973. 86 p, 16 tab, 14 fig, 124 ref. EPA grant EP-00319/Program Element No 1D2311.

Descriptors: *Pesticides, *Herbicides, *Wood wastes, *Lignins, *Cellulose, *Pulp wastes, *Forest management, Trees, Coniferous trees, Theoretical studies, Economic feasibility, Sawdust, Agricultural chemicals, Chemicals, Solid wastes, Toxicity, Safety.
Identifiers: Lignocellulose, Agricultural wastes, 2-4-D (2-4-dihydroxyphenoxybutyric acid), Controlled release pesticides, Corn cobs, Bagasse, Oat hulls.

The potential utilization of large volumes of agricultural residues, lignins, and wood wastes, such as bark, sawdust, corncobs, oat hulls, and sugarcane bagasse, by chemical combination with pesticides was investigated. The preparation of pesticides with prolonged effectiveness and controlled-release characteristics from lignocellulosic wastes is described, and their economics are discussed. Theories permitting the effective period of such compounds to be predicted were developed and validated. Combinations of such wastes with 2,4-D (2,4-dichlorophenoxybutyric acid) were found to yield safely applicable herbicides effective in suppressing weeds and brush in the presence of conifers and in thereby substantially accelerating the growth of trees. (Brown-IPC)
W74-05286

INVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
Environment Canada, Water Pollution Control Directorate, Economic and Technical Review Report EPS 3-WP-73-5, Oct. 1973. 15 p. 2 tab, 1 map.

Descriptors: *Irrigated land, *Soil disposal fields, *Waste water disposal, *Industrial wastes, *Canada, *Great Lakes Region, Sprinkler irrigation, Seasonal, Winter, Irrigation, Irrigation practices, Irrigation ditches, Pulp wastes, Economic efficiency, Food processing industry, Farm management, Farm wastes, Waste disposal, Surveys.
Identifiers: Ridge and furrow disposal, Underdraining.

This government-authorized survey of industrial and sanitary effluent treatment systems using spray irrigation as partial or total disposal method included 60 industrial plant operations in Ontario, mostly farms and food processors, but also one paper mill (Strathcona Paper Co. Ltd.). The general usefulness of spray irrigation as a relatively cheap waste disposal method is emphasized. In spite of the small land area involved (ca. 2600 acres), nearly 1 billion gal of high-strength wastes are treated thus annually without major problems, such as shock loading. Sprayfield disposal is attractive to small enterprises with low capital, such as dairy and hog farms. Urban expansion and Canadian winters are the two major factors limiting more widespread use of this method. In some instances, ridge-and-furrow disposal is practiced in winter. Underdraining as a supplement to either ridge-and-furrow or spray disposal also deserves investigation, especially for industrial planning where extension of sewage facilities would cause ill-timed expenditures. Land used for irrigation is still available for later building purposes. (Brown-IPC)
W74-05288

A PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
G. Ranhagen.
Zellstoff und Papier, Vol 22, No 6, p 172-179, June 1973. 2 tab, 17 fig.

Descriptors: *Pulp wastes, Pulp and paper industry, *Industrial water, *Waste water treatment, *Pollution abatement, *Recirculated water, Air pollution, Water circulation, Mathematical models, Effluents, *Recycling.
Identifiers: Kraft mills.

Models are presented for various closed water systems with little or no effluent, as well as for pollution-free air systems, in an integrated kraft pulp and paper mill. It is concluded that certain combinations could make the closed system a reality for the kraft industry, not just wishful thinking. (Ward-IPC)
W74-05289

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
D. E. Pingry, and A. B. Whinston.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EEI, Proceedings paper No 10322, p 61-75, February 1974. 1 fig, 9 tab, 7 equ, 8 ref.

Descriptors: Environmental engineering, *Indiana, *Water pollution control, *Alternative planning, River basins, Economics, *Comprehensive planning, Temperature, Dissolved oxygen, Cost-benefit analysis, Optimization, Simulation analysis, Treatment facilities, Regional analysis, Methodology, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, Multiobjective planning, *Cost minimization, Streeter-Phelps models, *West Fork White River(Ind.).

A methodology which takes advantage of variances in stream assimilative capacity and treats water pollution as a regional, basin-wide problem is applied to the West Fork White River in Indiana. A simulation model of river basin water quality serves as the constraint set for an optimization model that searches for the minimum cost solutions given the quality goals. Specifically, the traditional Streeter-Phelps dissolved oxygen model is integrated with a heat decay model. The resulting quality model is incorporated into a nonlinear programming river basin model which is used to calculate least-cost water treatment systems for the West Fork White River, given several alternative water quality goals. The effect of the different goals on the annual total cost of the system is examined. Special attention is focused on the possibility of relaxing the quality goals downstream from major effluent sources in exchange for increased quality upstream from these sources. The role of the planning model as an information source for decision making is examined. An appendix includes a summary of the nonlinear algorithm used and, in particular, the methods used to handle large-scale problems. (Bell-Cornell)
W74-05384

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
O. G. Lindholm.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 21-40 (Chapter 1), 1973.

Descriptors: *Water pollution control, *Waste water disposal, *Model studies, *Computer models, *Sewage treatment, *Networks, Hydrology, Rainfall-runoff relationships, Storm runoff, Pipes, Storage capacity, Sludge treatment, Optimization, Systems analysis, Costs, *Computer programs.
Identifiers: Gradient techniques.

Presented are four computer programs developed by the Norwegian Institute for Water Research for a total analysis and simulation of sewerage systems. The main objectives of these programs, written in FORTRAN, were to characterize wastewater flow through the various components of the sewerage system, to minimize the leakage of wastewater from the system, and to determine economically optimal systems. The four specific models that were developed are presented: (1) Wastewater and stormwater runoff model; (2) wastewater treatment plant model; (3) sludge treatment plant model; and (4) cost analysis program. The network model describes the pattern of stormwater runoff in the sewer network, determining the variation in discharge at any given point in the network for each minute of a given rainfall. Fifteen features built into the model are given. The sewage treatment plant model studies the performance of such plant receiving both sewage and rainwater runoff over a given period. The sludge treatment plant model considers: thickner, anaerobic digestion, aerobic stabilization, sludge centrifuge, sieve band press, and vacuum filters. The optimization technique used is a combination of a trial-and-error approach and a gradient method. The models may be linked together but at present most are operated independently. (Bell-Cornell)
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. H. Hahn, P. M. Meier, and H. Orth.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 41-60 (Chapter 2), 1973. 4 fig, 2 tab, 5 equ, 16 ref.

Descriptors: *Water pollution control, *Waste water(Pollution), *Treatment facilities, *Alternative planning, *Resource allocation, *Algorithms, Optimization, Methodology, Costs, Benefits, Management, Water transfer, Canals, Networks, Mathematical models, Systems analysis.
Identifiers: *Regional planning, *Branch-and-Bound strategy, *Regional water systems, Nonlinear programming, Search strategy.

There is presently a trend towards regionalization in water supply and wastewater disposal. This tendency is due to a number of factors, including increases in the cost of transporting wastewater over long distances, an increased use of surface water, and pressure from administrations to form regional systems. The individual parts of a sewerage system--interceptors, pumping stations, treatment plants--show economies of scale indicating that cost savings can be obtained through regional systems. Definite advantages and quantitative benefits are procured from planning, constructing, and operating larger plants. A mathematical formulation of the problem and an algorithm for solution are presented. The problem herein is defined by the question: which is the optimal allocation of wastewater to different wastewater treatment plants, located at different points, so that total costs minus total benefits are minimized. The problem is solved using a simultaneous technical and economic optimization. It is necessary to investigate the largest number of meaningful alternatives without excluding some solutions on the basis of engineering judgment; the best utilization of large quantities of information is warrented. A new planning approach for determination of the optimal solution is presented and applied to the above problem. This technique, the Branch-and-Bound strategy, is compared with traditional methods of regional wastewater system planning. (Bell-Cornell)
W74-05389

5E. Ultimate Disposal Of Wastes

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5C.
W74-04863

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05127

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-05176

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
For primary bibliographic entry see Field 5D.
W74-05263

WHITHER CLARIFIED SLUDGE. (WOHIN MIT DEM KLAERSCHLAMM.),
R. B. Firnhaber.
Der Papiermacher, Vol 22, No 1, p 12-14, Jan. 20, 1973. 1 fig, 1 tab.

Descriptors: *Sludge disposal, *Pulp wastes, *Incineration, Fuels, Drying, Dewatering, Sludge treatment, Pulp and paper industry, *Waste disposal.
Identifiers: Furnaces.

The possibilities for disposal of clarified industrial sludges by incineration are discussed, including dewatering and drying equipment, furnace designs, and the fuel value of sedimented effluent sludges from paper mills as a function of their chemical composition. In West Germany, 18 million tons of clarifier sludge from effluent treatment are being produced annually with more than 90% water content. As was demonstrated by the city of Zurich, such sludges can be burned together with municipal refuse, provided they are first autoclaved (at 200C and 16 bar pressure) to facilitate their thickening in filter presses to ca. 45% moisture. (Speckhard-IPC)
W74-05266

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
For primary bibliographic entry see Field 5D.
W74-05274

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
For primary bibliographic entry see Field 5D.
W74-05286

INVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
For primary bibliographic entry see Field 5D.
W74-05288

5F. Water Treatment and Quality Alteration

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
Available from University of Illinois, Publications Office, Urbana, Ill. 61801 for $2.00. Conference conducted by Illinois Dept of Public Health and Univ of Illinois, Feb 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, August 1962. 84 p.

Descriptors: *Water treatment, *Design, *Construction, *Distribution systems, *Corrosion, Hydraulics, Sanitary engineering.
Identifiers: *Pipe materials.

Nine papers pertinent to the hydraulics, design, materials, construction, and maintenance of water distribution systems are presented. Titles are: Hydraulics of Water Distribution Systems; Applications of System Analyzers: A Summary; Pipe Materials, Coatings, and Joints for Water Distribution Systems; Water Main Laying; Tapping, Disinfection, and Inspection of Water Mains; Observing Fire Protection Requirements in Future Water System Design; Maintenance of Water Distribution Systems; Values, Hydrants, and Main Line Meters; and Domestic Service Meters. (See W74-05007 thru W74-05015) (Bean-AWWARF)
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
C. W. Reh.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, February 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 6-22, August 1962. 16 fig, 3 tab, 4 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Municipal water, sMathematical models, Pipelines, Public utilities, Simulation analysis, Pipe flow, Distribution systems, Computer programs.

Methods for the analysis and design of water distribution systems are reviewed. The use of computers has facilitated this study. A program is available for balancing equivalent pipe lengths. It is feasible to consider writing a design program for a digital computer which would permit direct determination of the best combination of pipes to satisfy prescribed conditions as defined by a generalized equation. (See also W74-05006) (Knapp-USGS)
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. B. McPherson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 23-44, August 1962. 11 fig, 4 tab, 48 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Design, Analog models, Simulation analysis, Digital computers, Mathematical models, Pipelines, Public utilities, Pipe flow, Distribution systems.

The principal features, advantages, and liabilities of various devices used in calculating the hydraulic performance of water distribution system networks are outlined. With the availability of modern computing devices there is no reason for perfunctory design or arbitrary methods of analysis. A good design contains a degree of flexibility and remains a good design only so long as it is continuously reviewed, revaluated, and modified to conform with obvious departures from previous projections. The analog model is the preferred design tool for network balancing and design, and the digital computer is the preferred tool for system balancing. (See also W74-05006) (Knapp-USGS)
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
H. H. Benjes.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 45-49, August 1962. 18 ref.

Descriptors: *Water distribution(Applied), *Pipelines, *Pipes, *Design, Metal pipes, Concrete pipes, Joints(Connections), Plumbing.

Cast iron or asbestos-cement pipe is ordinarily used in the smaller sizes for distribution systems, although cement-protected steel pipe is generally used in certain cities in the West. Cast iron pipe is the most generally accepted type for small sizes because of its long satisfactory experience record, and its ease of laying and tapping. Cast iron pipe is not suitable for some locations where soil corrosion or electrolysis is detrimental to the use of unprotected metal pipe. In these locations asbestos-cement pipe may be used. In many cities the present trend is not to use cast iron or asbestos-cement for the larger mains because of the brittleness of the materials and the consequent possibility of line breaks when subjected to soil movement, settlement, or shock loads. Asbestos-cement pipe should not be used in tight soils which are subject to shrinkage with changes in moisture content. When used in these locations, the pipe should be completely embedded in granular material. Whenever possible, all materials incorporated in a water distribution system should be selected on the basis of providing reliable service for the long-time needs of the customers served. (See also W74-05006) (Knapp-USGS)
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
G. T. Watson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 50-54, August 1962.

Descriptors: *Pipes, *Pipelines, *Construction, Design, Excavation, Distribution systems, Engineering.
Identifiers: *Water main laying.

Methods for careful and proper water main installation are briefly reviewed. Four basic products are cast iron, asbestos-cement, steel, and prestressed concrete water pipe. Basic soil conditions with which to contend in water main installation are clay, loam, peat, granular material, and rock. (See also W74-05006) (Knapp-USGS)
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
R. A. Wilford.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 55-59, August 1962. 6 ref.

Descriptors: *Pipes, *Pipelines, *Construction, *Disinfection, Design, Excavation, Distribution systems, Engineering, Water treatment.
Identifiers: *Tapping(Water mains).

Inspection, disinfection, and tapping of water mains are briefly reviewed. The most important thing that an inspector must watch in laying water main is the bedding conditions for the pipe. More failures occur because of poor bedding than for any other single factor. Complete disinfection of a new water main can be obtained if the following measures are taken during and after installation: (1) keep the pipe reasonably clean while laying; (2) cover the end of the pipe after each day so that no small animals can get in; (3) allow plenty of openings so that a velocity of 2 to 3 fps can be obtained when flushing; (4) use a chlorine dosage of at least 10 ppm and allow a contact period of 24 hours; (5) flush well before and after the contact period; and (6) test before turning into service. Tapping water mains is a relatively simple operation,and the methods used for tapping have not changed a great deal for several decades. (See also W74-05006) (Knapp-USGS)
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
A. H. Gent.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 60-66, August 1962. 2 tab.

Descriptors: *Water distribution(Applied), *Pipes, *Pipelines, *Cities, Distribution systems.
Identifiers: *Fire protection(Water systems).

The fire protection aspects of several features of water supply design are briefly reviewed. Fire protection reserve provides the volume and the pressure required for public fire protection and supplies private protection facilities such as automatic sprinklers and standpipe systems. This fire reserve should be sufficient to meet the fire service requirements prescribed by the National Board of Fire Underwriters. This fire demand represents a large percentage of the total in small cities, varying from about 80% or more in cities under 5,000 to about 60% in cities of 25,000 population. (See also W74-05006) (Knapp-USGS)
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
J. M. Rogeven.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 67-72, August 1962.

Descriptors: *Water distribution(Applied), *Pipes, *Repairing, *Maintenance, Pipelines, Distribution systems, Municipal water.

The best and most economical way to maintain a water distribution system is to have well-trained and well-paid personnel, good records, good reliable equipment, and a complete inventory of repair items. Leaks, large or small, are the most expensive and difficult maintenance jobs. There are several manufacturers of leak clamps for all of the different types of pipes and pipe joints, including a clamp which covers the entire bell. (See also W74-05006) (Knapp-USGS)
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
G. H. Ruston.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 73-78, August 1962. 2 fig.

Descriptors: *Water distribution(Applied), *Valves, *Hydrants, *Water measurement, Instrumentation, Pipes, Distribution systems, Municipal water.
Identifiers: Water meters.

Main-line or master meters provide the means of determining total flow and are the basis for accurate accounting, chemical treatment, and to determine unaccounted water. With accurate main-line meters and accurate meters at the point of consumption, the percentage of loss can be readily determined. Valves should be located uniformly throughout the system in reference to street intersections, such as on property line, curb line, sidewalk line, etc., as these help in locating valves in emergencies. In general, hydrants should be placed with consideration of their possible use as reflected in the local hazards. Hose lines more than 400 to 500 feet long are inefficient and a source of delay. Therefore, hydrants should not be distributed more than 300 to 400 feet from the buildings to be protected. Furthermore, friction losses use up pressures available in hose lines at a rapid rate, and this factor definitely limits the length of hose lines. (See also W74-05006) (Knapp-USGS)
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
A. R. Moore.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 79-83, August 1962. 7 ref.

Descriptors: *Water measurement, *Instrumentation, *Water distribution(Applied), Maintenance, Distribution systems, Municipal water.
Identifiers: *Water meters.

Water meters commonly used for household, commercial, and industrial services include the positive displacement, velocity, compound, and fire line meters. Proper maintenance of water meters will pay substantial dividends. The larger meters in common use, such as 6-, 8-, and 10-inch compound or fire line meters, should be tested frequently because of the large revenue involved. (See also W74-05006) (Knapp-USGS)
W74-05015

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
D. Rapoza.
Public Works, Vol 102, No 5, p 86-87, 1971. 1 tab.

Descriptors: *Water supply, *Quality control, *Aeration, Reservoirs, Costs, New Hampshire, Destratification, Oxygenation.
Identifiers: *Greenville(N.H.), Air Aqua System.

Although New Hampshire's Greenville Reservoir was treated by flocculation, settling, rapid sand filtration, and chlorination, the water was dark from color imparted by decaying organic matter, high iron content turned laundry brown and bleaching attempts resulted in reactions with manganese, turning clothes black; in addition, there was often a strong hydrogen sulfide odor. To improve the water quality a controlled aeration system was designed to lift 150 MG of water from the bottom to the surface per day; the reservoir has a 750 MG capacity of which 213 MG is allocated for water supply. The stabilization and oxygenation effort resulted in better water quality immediately after installation of the equipment, at a cost of $8750. Shore-housed compressors pump air via a total of 4000 ft of polyethylene weighted tubing to eight individually-fed 250-ft lines of valved tubing, also of polyethylene. Air is supplied by eight 3/4-hp electric motor driven compressors. Now the town is getting excellent water in winter as well as summer. Power costs are estimated to be about $90 per month. Chemical costs before the system was installed were reduced to $39.91 per MG in August 1970. (Auen-Wisconsin)
W74-05063

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W74-05246

5G. Water Quality Control

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
For primary bibliographic entry see Field 5D.
W74-04851

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
November 1973. 274 p.

Descriptors: *Grants, *Projects, *Research and development, Pollution abatement, Water pollution control.
Identifiers: *Environmental protection agency, Pollution control.

This Environmental Protection Agency (EPA) Extramural Program information bulletin explains how to do business with the Office of Research and Development and provides a listing of tasks planned to be funded as research and demonstration projects during each fiscal year. The Office of Research and Development (OR and D) conducts and supports research, development and demonstration efforts on a wide variety of subjects primarily related to pollution sources and effects, environmental sciences and pollution control technology. OR and D also is responsible for assuring the quality control and standardization of analytical techniques for the Environmental Protection Agency as well as promoting, through technology transfer, the use of new techniques, processes, methodologies, etc., in pollution control. The purpose of this bulletin is twofold: (1) to acquaint the research and development community with general guidelines for working with the EPA's Office of Research and Development under grant or contract support, and (2) to make publicly available a list of specific grant and contract Tasks which OR and D plans to fund during the current Fiscal Year. This listing is planned to be issued at the beginning of each new fiscal year. (Knapp-USGS)
W74-04913

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
G. D. Gumtz, and T. P. Meloy.
Copy available from GPO Sup Doc as EP1.23:670/2-73-068, $4.00; microfiche from NTIS as PB-229 576 $1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-068, September 1973. 159 p, 20 fig, 6 tab. EPA Project 15080 HET, Contract 68-01-0068.

Descriptors: *Oil spills, Oil pollution, Recycling, *Foam separation, Separation techniques, *Pollution abatement, Ships, *Sorption, Capital costs, Operating costs.
Identifiers: *Oil recovery system, *Sorbents.

The feasibility of recovering oil in slicks 1mm and thicker by the use of recycled sorbents has been shown in laboratory and wave tank tests. Sorbents made of recticulated foam are broadcast on the sea, herded by a boom, picked up by a porous belt and the oil squeezed out of the sorbents by a wringer. The sorbents are then rebroadcast on the sea for further oil recovery. General equations were developed for basic sorption properties, sorbent broadcasting, sorbent herding, sorbent pickup, recovery of oil from the sorbent and for the total system. Based on the laboratory modeling and general equations, the total system concept was developed. It was concluded that one inch cube sorbent particles distributed in a shrouded rectilinear screw fed system was optimal. A 4/1 compression ratio of the slick by a boom herding the sorbent and oil to the channel would work under virtually any wave condition. Capital costs for this system are $216,500 and operating costs $59,500 per year. Economic studies made indicate that recovery cost is about 6 cents per gallon, assuming a system is used 22 days per year and a 20 year depreciation. For large spills the salvage cost of the oil could pay for the operation. The system has a nominal capacity of 5,000 gallons per hour. (EPA)
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set, for $40.00 for two parts. September 1972, 809p, OWRR W-130(9075) (1).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The bibliography of 2,416 abstracts includes, but is not limited to: statutes; state administrative regulations; state judicial decisions; federal statutes; federal administrative regulations; federal judicial decisions; treaties; articles and comments in serial publications; executive orders; monographs; committee reports; congressional hearings and documents; state legislative proceedings; state documents; conference reports; attorney general opinions; interstate compacts; and treaties. All abstracts appearing in the bibliography were prepared between 1968 and 1971. A majority were prepared from materials at the time; however, some documents, particularly judicial decisions, have been included regardless of their chronological date. Moreover, much of the secondary material abstracted relates to or reviews earlier concepts and enactments. All abstracts have been categorized into one of eight subject groups: Foreign and International, Federal Legislation, Federal Regulations, Federal Judicial Decisions, State Legislation, State, Regional and Local Regulations, State Judicial Decisions, and General/Interdisciplinary Analysis. Within the major subject groups abstracts have been further categorized into 42 descriptive topics. (See also W74-05005)
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set for $40.00 for two parts. September 1972, 735p, OWRR W-130(9075) (2).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The Subject Index lists the title and location number of an abstract under several terms describing its content. The majority of subject-index terms have been taken from the controlled vocabulary of the Water Resources Thesaurus (1st ed.), 1966, published by the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior. (See also W74-05004)
W74-05005

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
For primary bibliographic entry see Field 6G.
W74-05027

AERATION SYSTEM REVITALIZES LAKES.
For primary bibliographic entry see Field 5C.
W74-05060

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
For primary bibliographic entry see Field 5F.
W74-05063

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
H. J. Turner, R. E. Towne, and T. P. Frost.
New England Water Works Association Journal, Vol 86, No 3, p 267-275, 1972. 2 fig, 12 ref.

Descriptors: *Algal control, *Destratification, *Mixing, Methodology, New Hampshire, Cyanophyta, Chlorophyta, Eutrophication.
Identifiers: *Kezar Lake(N.H.), Aphanizomenon.

Copper sulfate controlled Anabaena successfully in Kezar Lake, New Hampshire, but in 1966 it was replaced by Aphanizomenon which proved resistant to copper sulfate. The situation was sufficiently serious to affect lake-front property values, which declined so much that assessment appraisals were reduced as much as 30%. To control the nuisance algae, an economical method was chosen as simple bubbling with air. Four air compressors were installed, each driven by a 3 hp motor, on the shore with 2-inch i.d. plastic pipe leading to the deepest part of the lake (27 ft.). When the compressors were started, the algal cell count was over a million per milliliter near the surface and there was practically no oxygen near the bottom; the Secchi disc reading was 1-1/2 feet. After a month of bubbling, algal cell count dropped below 30,000 cells/ml and Secchi disc readings increased to over 3-1/2 feet. Algal crop composition changed from blue-greens to the less objectionable greens and Secchi disc readings remained in excess of four feet. Observations suggest that mixing may accelerate algal successions and that destratification may have a beneficial long-term effect on a lake. (Jones-Wisconsin)
W74-05064

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

REPORT OF THE POLLUTION COMMISSION, PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
For primary bibliographic entry see Field 5B.
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION,
Parsons (Ralph M.) Co., Los Angeles, Calif.
C. K. Stoddard.
Copy available from GPO Sup Doc as EP1.23:670/2-73-092, $1.55; microfiche from NTIS

as PB-229 407 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-092, October 1973. 125 p, 16 fig, 8 tab, 5 ref. EPA Project 14010 EJF (No CR84). Contract WPRD-242-01 to Pennsylvania Dept. of Environmental Resources.

Descriptors: *Acid mine water, *Mine water, Neutralization, Water pollution, Flow control, *Sealants, *Coal mine wastes, *Pennsylvania, *Slurries, Lime, Pollution abatement, Mine drainage.

Laboratory tests with synthetic acid mine water show the sealing effect of the gelatinous precipitate that forms when hydrated lime or powdered limestone is added in a simulated mine entry closed by a porous barrier. Field tests were conducted in a recently abandoned coal mine. Hydrated lime and limestone slurries were pumped into the mine water behind rubble barriers through 2-inch steel pipes to test the laboratory findings. The outflow was observed at weirs attached to the ends of two 12-inch diameter drain pipes. The results indicated that only temporary sealing of the outflow was achieved and that neutralization took place when the interior water flow conditions were favorable. Placement of the injection outlets, dispersion of the lime slurry, volume of water flowing, and direction of flow in the mine interior to other outlets are important controlling variables that greatly affect the efficiency of the sealing and neutralization of the outflowing acid mine water. (EPA)
W74-05106

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W74-05108

COMBINED SEWER OVERFLOW FOR THE HUDSON RIVER CONFERENCE,
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 5D.
W74-05112

GENERAL ENVIRONMENTAL SITING GUIDES FOR NUCLEAR POWER PLANTS -- TOPICS AND BASES, (DRAFT).
Directorate of Regulatory Standards (AEC), Washington, D.C.
October 31, 1973. 130 p, 12 fig, 179 ref.

Descriptors: *Nuclear powerplants, *Sites, Locations, *Regulation, *Environment, *Safety, Ecology, Soils, Geology, Climatology, Hydrology, Public health, Population, *Water pollution control, Water supply.

The development of general environmental siting guides for nuclear powerplants is one of the steps being taken by the United States Atomic Energy Commission to improve the selection of environmentally acceptable sites and to shorten the overall licensing process for light-water reactors. The guides must be based on sound principles of environment management and should be a maximum use to industry and the concerned public in evaluating and improving conventional siting practices. The guides should also be of general value for assessing the desirability and practicality of advanced siting concepts such as nuclear power parks, offshore and lagoon sites for floating plants, and underground and metropolitan sites. (Houser-ORNL)
W74-05180

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
L. R. Rogers, and C. L. Henderson.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 63-67. (1971).

Descriptors: *Law enforcement, *Legislation, Management, *Legal aspects, *Regulation, *Administration, Administrative agencies, *Standards, Safety, Population, Public health, Environment, Radiation, Water, Water quality, Air, Soils, Organizations.
Identifiers: *National Environmental Policy Act.

In response to growing public awareness and concern for protection of the natural environment, the federal government enacted on January 1, 1970, the most comprehensive and far reaching of the several federal statutes directed specifically toward the protection of the environment. The statute is known as the National Environmental Policy Act of 1969, or NEPA. Broadly speaking, the Act makes it the continuing responsibility of the federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources toward certain stated ends of environmental protection. An AEC policy statement for implementing NEPA is discussed. One of the underlying themes in the new policy statement is that the preservation of environmental values can best be accomplished through the establishment of environmental quality standards and requirements by appropriate federal, state, and regional agencies having responsibility for environmental protection, and the AEC urges that these agencies proceed promptly to establish such standards. A draft of 'Guide to the Preparation of Environmental Reports for Nuclear Power Plants' has been prepared and issued for comment and interim use. (See also W74-05181) (Houser-ORNL)
W74-05186

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
For primary bibliographic entry see Field 5B.
W74-05249

NEW MEASURING METHODS FOR EVALUATING WASTE WATER QUALITY (NEUERE MESSVERFAHREN ZUR BEURTEILUNG DER ABWASSERQUALITAET),
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
For primary bibliographic entry see Field 5A.
W74-05259

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungesstelle.
For primary bibliographic entry see Field 5D.
W74-05261

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W74-05277

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

RELIABILITY AND ECONOMIC OPTIMIZATION FOR URBAN RETURN FLOWS MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-05333

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
For primary bibliographic entry see Field 3F.
W74-05371

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05384

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, p 3-18 (Introduction), 1973. 88 ref.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

In this introductory chapter, Deininger discusses the use of systems analysis and mathematical modeling for formulating and solving problems of environmental pollution. He defines the systems approach and considers seven standard steps in a systems analysis study. They include: (1) problem formulation; (2) model construction; (3) definition of criterion function; (4) data collection; (5) derivation of optimal solutions; (6) model, solution, and sensitivity testing; and (7) implementation of the best solution. Next, Deininger acknowledges the techniques and tools of systems analysis, i.e., optimization; linear, non-linear, and dynamic programming; stochastic and integer programming; queueing theory; simulation and network techniques; PERT, CPM; gradient techniques; and digital computers. This paper then examines water pollution problems--with special attention paid to the historic development of the use of systems analysis--then solid waste disposal problems, and then air pollution problems. Finally, Deininger looks at total and global environmental models and summarizes current modeling efforts. (Bell-Cornell)
W74-05387

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.

For primary bibliographic entry see Field 5B.
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
G. T. Orlob.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 91-105 (Chapter 4), 1973. 5 fig, 10 equ, 11 ref.

Descriptors: *Simulation analysis, *Aquatic environment, *Water pollution control, *Planning, *Methodology, River basins, Estuaries, Reservoirs, Mathematical models, Hydrology, Systems analysis.

A basic approach to simulation of the aquatic environment that has proven to be practical in pollution control planning is outlined in detail. There are three fundamental steps in model design: conceptual, functional, and computational representation. A discussion of the first two steps serves to illustrate the model development procedure, the third step being out of the scope of this paper. Under conceptual representation, determining model scale and discretizing the system are considered. Within the functional representation, advection-diffusion equations, the effects of scale, mass conservation equations, and motion and continuity are discussed. (Computational representation includes selecting a solution technique and forming input and output.) Included as illustrative examples in this simulation study are the Texas Water Plan, model idealization of a river basin, conceptual representation of a reservoir, and the San Francisco Bay-Delta estuarial mathematical model network, including a definition sketch--WRE node-link estuarial model. Following this approach, useful models have been developed for many classes of problems and are now being applied in planning studies in the United States. Among those that may be cited are models for: stream water quality; reservoir temperature; estuarial hydrodynamics and quality; groundwater quality; and aquatic ecology. (Bell-Cornell)
W74-05391

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
W. O. Spofford, Jr.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 403-436 (Chapter 19), 1973. 2 fig, 1 tab, 36 equ, 49 ref.

Descriptors: Environment, *Quality control, *Management, *Model studies, *Water quality, *Wastes, Air pollution, Waste disposal, Regions, Systems analysis, Optimization, Simulation analysis.
Identifiers: Residuals management, *Environmental quality, Nonlinear programming.

The effort to integrate models of air and water pollution and solid waste disposal into an overall environmental quality model is described. The term 'total environmental quality management models' is defined as meaning 'regional residuals-environmental quality management models,' where these include only the impacts on environmental quality of residuals discharges to the air, water, and land environments. The term 'residual' is preferred here to that of 'waste.' The entire regional residuals management system is delineated, including the range of management options available to society for improving environmental quality; indicated is how all the system components may be expressed and ultimately linked together within the same computational framework. The residuals management model is discussed qualitatively and then formulated quantitatively; mathematical forms of the various environmental models are discussed, and computational schemes for selecting an optimal management strategy are suggested. Included are: residuals generation and discharge models; environmental modification and environmental quality models; a management model formulation and a procedure for optimizing a nonlinear objective function subject to a set of linear constraints; an atmospheric dispersion model; an aquatic ecosystem model; and more optimization procedures, including a heuristic approach. The regional residuals management model suggested herein is more complex than the classical management model approach, and it requires a substantial amount of computer resources. (Bell-Cornell)
W74-05398

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-04858

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Los Angeles. School of Engineering and Applied Sciences.
W. W-G. Yeh, L. Becker, W. J. Trott, G. W. Tauxe, and L. F. Hancock.
Report UCLA-ENG-7390, November 1973. 75 p, 2 fig, 2 tab, 17 ref, 2 append. USDI Contract 14-06-200-5882A.

Descriptors: *Reservoir operation, *Optimization, Dynamic programming, California, Linear programming, Least squares method, Streamflow forecasting, Bibliographies, Abstracts, Systems analysis, Water management(Applied).
Identifiers: *California Central Valley Project.

Dynamic programming was studied for use in selection of an optimal reservoir storage policy path through a specified number of policy periods, and linear programming for use in period by period optimization. The policy periods, in case of the real time operation, correspond to the number of time periods for which a streamflow prediction model is reasonably reliable. The method results in relatively easy computer implementation and high flexibility, in that changes in constraints are simply made and additional reservoirs easily added. The method is useful for the determination of release policies in real time operation of an existing system. The methods are demonstrated in a real system of reservoirs and hydroelectric facilities associated with the Shasta, Trinity and Folsom subsystems of the California Central Valley Project. The two-stage least squares estimation method gives unbiased estimators when the system is described by a set of simultaneous equations in which each equation contains several dependent variables, which also occur in other equations. In Shasta and Clair Engle reservoirs, California, the dependent variables are the February to July inflows while the independent variables include snow-water contents and precipitation indices at several stations within the two watersheds. An annotated bibliography was compiled of the available practical techniques for considering the adverse effects of daily and weekly operations on the risk of not meeting firm water and power commitments at some future date. (Knapp-USGS)
W74-05167

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 268-277. 2 tab.

Descriptors: *Land development, *Decision making, *Operations research, *Systems analysis, *Arid lands, Agriculture, Land management, Land use, Management, Planning, Alternate planning, Optimization, Risks, Scheduling, Simulation analysis, Hydrologic systems, Model studies.

Arid land development is an integral part of water resources development planning, entailing the selection of certain alternate procedures in light of a given set of parameters. The selection process may be facilitated by using operations research, systems analysis or decision analysis as a tool. Examples of such use are illustrated by a watershed problem, where plans to induce runoff need to be studied for their effects, and an agricultural problem with irrigation scheduling constraints. The techniques involved are still relatively new, leaving to the ingenuity of the planner a key part of the decision process. The systems analyst makes the decision-making process easier by showing the

results of each alternative choice as it relates to the solution of the given problem and to byproducts of the decision. (Muller-Arizona)
W74-05223

RELIABILITY AND ECONOMIC OPTIMIZATION FOR URBAN RETURN FLOWS MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-05333

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
For primary bibliographic entry see Field 8A.
W74-05383

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05384

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05385

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5G.
W74-05387

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5D.
W74-05389

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.
For primary bibliographic entry see Field 5B.
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W74-05391

MATHEMATICAL MODEL FOR OXYGEN BALANCE IN RIVERS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
For primary bibliographic entry see Field 5B.
W74-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
W. Schmid, G. Kuhlmann, and J. Muhlbauer.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 181-196 (Chapter 8), 1973. 4 fig, 3 tab.

Descriptors: Water resources development, *Water users, *Weirs, *Canals, Construction, *Cost-benefit analysis, *Simulation analysis, *Water supply, Rivers, Reservoirs, Water quantity, Water quality, Navigation, Computer programs, Investment, Pricing, Mathematical models, Systems analysis.
Identifiers: *Economic analysis, Receiving water capacity.

An approach is presented for determining the net benefits accruing to urban, industrial, and agricultural water users from the construction of weirs and canals for navigation purposes. Included is an economic appraisal of changes in water use caused by such investment. Canals and weirs influence the water supply and receiving water capacity of a channel-reservoir system; the major consequences of such construction are alterations of water supply in quantitative and in qualitative terms and an alteration of the receiving water capacity. These alterations affect water utilization (except when they occur within the range of excessive quantity or quality) and are economically relevant in the form of costs and benefits. The approach presented combines cost-benefit analysis and a five-element simulation model to derive the physical benefits accruing to water users. On the basis of this model, a computer program was developed that was tested for two sections of the German system of domestic waterways. The next step is to develop a general model for transforming the net benefits in physical terms into net monetary benefits. Thus far, only the basic pricing concept has been developed, which is based upon an opportunity cost approach. (Bell-Cornell)
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
M. Benedini.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 205-215 (Chapter 10), 1973.

Descriptors: Water resources development, *Management, *Water supply, *Hydroelectric power, *Simulation analysis, *Irrigation, *Water demand, *Water quality control, *Reservoirs, Seasonal, Dams, Downstream, Reach(Streams), Flow, Optimization, Mathematical models, Systems analysis.
Identifiers: *Italy(Tiber River).

The principle aspects of water resources management in Italy are discussed, and simulation and optimization techniques applied to existing problems are described; there is an increasing demand (in the face of scarce supplies) for domestic, irrigation, and industrial water, with the need for increasing the individual income. Needed also are large treatment plants for the reuse of wastewaters. But management of Italian water resources now consists mainly of settling conflicts between existing uses, rather than planning new hydraulic works. Hydroelectric power production suffers from limitations imposed by flood control needs. Described is a simulation model, based on a continuity equation, which can be used with both historical and synthetic hydrological input, as well as in a deterministic and probabilistic manner. Difficulties of mathematical and economic evaluation of water uses in Italy are considered. Problems of irrigation water demand, water supply, pollution, and water quality are discussed, considering the application of optimization and simulation modeling. Finally, the work of the 'Istituto di Ricerca sulle Acque' in developing methodologies for studying integrated utilization of the resources in a large catchment area is reported. The area chosen for study was that of the Tiber River. (Bell-Cornell)
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

6B. Evaluation Process

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 4A.
W74-04854

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W74-04974

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
J. Tourbier.
Available from the National Technical Information Service as PB-228 853, $13.75 in paper copy, $1.45 in microfiche. Final Report. April 1973. 199 p, 34 fig, 5 append. OWRR C-2185(3382) (1).

Descriptors: *Comprehensive planning, Water resources development, *Model studies, *Land use, *Urban hydrology, Surface waters, Subsur-

face waters, Percolation, Permeability, Urbanization, Land classification, *Delaware, Systems analysis, Planning.
Identifiers: Urban water resources protection, *Christina River Basin(Delaware), *Environmental protection measures, Land use policy, Non-point source pollution.

The Christina River Basin near Wilmington, Delaware was used as a model area to determine methods that could be used by the public sector through its planning and regulatory powers to first assess the impact of land development upon water resources and certain hydrologic phenomena and then to create a responsive land use policy and program. The impact of urban development on the natural pattern of water flow is a function of 2 sets of variables, the natural characteristics of the land and the type and intensity of development. Land areas were classified into categories called site classes on the basis of the properties that influenced the water regimen. Land uses were described in terms of their water-related impact. A computer program then related environmental protection measures, measures that can be incorporated into development while it proceeds, to the variables of site class and land use intensity. The cost distribution of these measures was used to evaluate regional land use policies and to indicate areas of natural resources limitations to development, to allow for guidance of land uses to areas where they would do the least damage. The program is heavily reliant on protection measures and their cost as an indication of problem areas. The selection of measures requires an assessment of the impact of land uses on hydrologic processes, a definition of levels of quality to be achieved, and the quantification of amelioration measures. The costing of protection measures requires specifications for construction. (Hoffman-North Carolina)
W74-04988

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
Draft. April 1973. 182 p, 8 fig, 36 tab, 182 ref, 4 append. Title III PL 89-80. Water Res. Plan. Act 1965.

Descriptors: Recreation, *Recreational demand, *Recreation facilities, *Water demand, *North Carolina, Water sports, Bodies of water, Economics, Land use, Natural resources, Water management, Reservoirs, Lakes, Environment, Water resources, Model studies, Rivers.
Identifiers: *Leisure, Recreation resource base, Simulation.

Demand for outdoor recreational facilities is increasing due to higher family income, increased mobility, leisure time, and population. North Carolina, with its varied water resources, provides recreational opportunities. A North Carolina comprehensive outdoor recreation plan recommends providing outdoor opportunities, preserving recreational areas, and achieving these functions in the best way. Recreational demand is concentrated primarily along the Piedmont Crescent. While an adequate recreational resource base is needed, distribution of bases in relation to population centers is also needed, as is quality of the base and time period when the resource is used. This study attempts to simulate visitation patterns around major lakes and reservoirs. It is estimated that 70% of visitors are from North Carolina. It also found that some areas with high recreational demand have few recreational opportunities. Federal attempts in recreational development, such as the National Park System, are discussed, as are lakeshore development, economic consideration, and other related topics. Recommendations presented include increasing public access to recreational areas, preserving natural resources, and balancing water-based recreational planning. Tables detailing recreational areas, (i.e. inland water bodies, farm ponds, fishing streams, coastal beaches) a description of simulation model utilized and a brief description of federal programs concerned with recreation are in the appendices. (Grden-North Carolina)
W74-04990

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
Final report. June, 1973. 250 p, 59 tab, 2 append. ALA-RX09-1020-0.

Descriptors: *Comprehensive planning, *Water management(Applied), *Drainage programs, *Water supply, Sewage, *Sewage treatment, Programs, Water, Water pollution control, Environmental effects, Channel improvement, *Alabama, *Community development.
Identifiers: Prattville(Ala.), Augusta Creek(Ala.), Alabama River.

Between 1963 and 1973 the population of Prattville grew by 98%. This growth is expected to continue, although at a declining rate of 5% per year. The comprehensive community development plan was undertaken to provide a framework for the future development of the Prattville urban community systems of land use, streets and highways, community utilities, community facilities, and public improvements. Recommendations are based upon interrelationships between subsystems of these systems. It is recommended that Prattville continue to draw upon underground wells for its drinking water supply. The water is of good quality; pollution of ground water supplies should not be a problem due to their depth and the natural purification from percolation. The storm drainage plan, based on 25 year storm data, proposes to utilize natural drainage courses, which to ensure continuation of natural stream life, will not be lined with concrete. A mandatory land dedication policy for drainageways also proposed. Sewage treatment capacity, under the plan, will be increased, not only to provide secondary treatment but also to eliminate the overflow of raw sewage presently being discharged into Augusta Creek. An interim plan for water pollution control abatement in Augusta Creek and the Alabama River is included. (Hoffman-North Carolina)
W74-04991

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
P. Loos.
Planning and Development in the Netherlands, Vol 4, No 1, p 107-122, 1970. 3 fig, 2 tab, 5 photos.

Descriptors: *Land reclamation, *Reclamation, Recreation, Land use, *Dikes, *Recreation facilities, Soil environment, Beaches, Soil types, Vegetation establishment, Soil structure, Water policy, Landscaping, Soil management, Land management.
Identifiers: *Netherlands(Ijsselmeer polders), *Oostelijk Flevoland(Neth), Polders, Aquatic sports areas, Sojourn accomodations, Nature terrains, Open space, Oecological Reserve.

Recreation is an important component of the way of life in the Netherlands due to a rise in prosperity, shorter working hours, an increase of automobile use, and higher education levels. A recreation plan for Oostelijk Flevoland, a polder reclaimed from the sea, is based upon dike delineation, landscape design, recreational needs, and soil types. This plan includes aquatic sports areas, shores and beaches, woods, planted areas, nature terrains, sojourn accommodations, and special points of attraction. A chain of border lakes has been created between the polders and the mainland offering many aquatic sports. Beaches have been developed along the dikes, together with a sewerage system to keep the water clean. Planted and wooded areas integrate agricultural and recreational areas. Meadow bird reserves, where the ground water has been artifically raised, fishing places, and the Oecological Reserve for studying the natural succession of plant and animal life have been created. Other special attractions include an agricultural exhibition, game parks for hoofed animals, and a museum depicting the history of land reclamation in the Netherlands. With this recreation plan, the Oostelijk Flevoland hopes to enhance the Dutch way of life. (Grden-North Carolina)
W74-05003

CALIFORNIA UNDERSEA AQUEDUCT RECONNAISSANCE: THE OCEANOGRAPHY (CUARO),
Naval Undersea Center, San Diego, Calif.
R. H. Riffenburgh.
Available from NTIS as AD-768 730, $5.75 in paper copy. Report No NUC TP 353, August 1973. 158 p, 41 fig, 10 tab, 36 ref.

Descriptors: California, *Aqueducts, Underwater, Waves(Water), Surges, Tsunamis, Density, Coastal engineering, Freshwater, Oceanography.
Identifiers: California Undersea Aqueduct.

The possibility is discussed of conveying fresh water from northern to southern California via a subsurface offshore aqueduct (The California Undersea Aqueduct). The specific region investigated was between Crescent City and San Diego from the 20- to 200-m depth contour. Available data on relevant variables were analyzed to provide information for aqueduct planning decisions. The variables and analyses most influential in planning the California Undersea Aqueduct were divided into two categories: variables influencing the 100-year survival of the aqueduct (century risks) and variables influencing the construction and maintenance of the aqueduct. Waves, surges, tsunamis, density, and light do not appear on the basis of reconnaissance data to pose insurmountable problems. Surface, water column, and bottom currents, including upwelling and internal wave phenomena, may or may not be prohibitive; data are inadequate, and additional information must be obtained from in situ observations. Canyons are not an insurmountable threat, but will pose innovative engineering challenges and probably be quite expensive. Additional data will also be required on these processes. (Sinha - OEIS)
W74-05040

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W74-05108

ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS OF PUBLIC WORKS, VOL. I PITTSBURGH AREA STUDIES, VOL. II. THE ALEGHENY COUNTY SANITARY AUTHORITY (ALCOSAN) FACILITY, VOL. III. IMPACT ANALYSIS,
Pittsburgh Univ., Pa. Environmental Engineering Program.
W. L. Garrison, R. Brumbaugh, B. Hillegas, and M. Rowe.
American Society of Civil Engineers, New York, New York, August 1972. 226 p, 24 fig, 38 tab, 336 ref. NSF: GI-29980.

Descriptors: *Project post-evaluation, *Social impact, *Economic impact, *Sewerage, *Waste water disposal, *Civil engineering, Sewage districts, Urban sociology, Methodology, Assessments, Evaluation, History, Forecasting, Project planning, Project benefits.
Identifiers: *Impact analysis, *Impact statements.

The development and operations were studied of the Allegheny County Sanitary Authority which provides sewerage and sewage disposal services for 72 communities in Allegheny County, Pennsylvania. The purpose was to identify and assess the social, economic and physical impacts attributable to the program and facilities of the Authority from the date of its inception. The overall objective was to develop study methods and techniques for impact analysis of various kinds of civil engineering programs and projects. This study was one part of a research project of the American Society of Civil Engineers titled 'Impact of Civil Engineering Projects on People and Nature'. The ASCE research project involved several studies all of which were focused on the development of a methodology for impact analysis. The ultimate usefulness of the results of this and subsequent studies that are planned by the ASCE will be in predicting the probable impacts of proposed civil engineering projects prior to their final design, construction and implementation. Recommendations are given for making additional studies of the Sanitary Authority. Other completed civil engineering projects located in the Pittsburgh area, and thought to be good subjects for impact study, are identified. A general discussion of impact analysis and study methodologies is included. (Poertner)
W74-05231

DEVELOPMENT OF WATER FACILITIES--BROOME COUNTY, 1967-2017.
Martin (R. J.) and V. O. Shumaker-Joint Venture, Vestal, N.Y.
County of Broome, New York, 1967. 11 p, 2 fig, 1 tab. CPWS-8.

Descriptors: *Water supply, *Long-term planning, *Water districts, *New York, *Local governments, Public utility districts, Public benefits, Water rates, Regional development.
Identifiers: *Broome County(New York).

The 43 existing separate public water systems in the County should be consolidated into one Part-County Water District. The single district would incorporate the water systems of the City of Binghamton, the Villages of Endicott and Johnson City, and the Towns of Binghamton, Chenango, Conklin, Dickinson, Fenton, Kirkwood, Maine, Union, Vestal, and Windsor. The general outline of the proposed district is shown. The forming of one water agency would eliminate all of the weaknesses that abound when there are 43 neighboring systems going their separate ways. The 43 systems now have available as much water as will be needed in 2017. While the cost of almost everything will multiply, the cost of water in 2017 need be no higher than it was in 1967. The establishment of a single water agency would save time, money, man-power, machines and materials plus intergovernmental paper-work and delay for all concerned. Every consumer in the new water union would immediately achieve fair and equal status. The person in dire need of water would be spared the long and arduous process of petition and public hearing before his town board. In some existing cases, even more time is lost because the town board has to petition a second municipality to provide water service. A description of the proposed water agency, customer charges, and a listing of advantages and specific recommendations are included. (Poertner)
W74-05232

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
For primary bibliographic entry see Field 5D.
W74-05233

SEWAGE COLLECTION AND TREATMENT SYSTEMS: ISSUES IN AND APPROACHES TO IMPACT ANALYSIS,
Pittsburgh Univ., Pa. Environmental Engineering Program.
W. L. Garrison, R. Brumbaugh, B. Hillegas, and M. Rowe.
American Society of Civil Engineers, New York, New York, August 1972. 38 p, 13 fig, 4 ref. NSF Grant no. GI-29980.

Descriptors: *Project post evaluation, *Civil engineering, *Social impact, *Economic impact, *Sewerage, *Sewage districts, Urban sociology, Methodology, Waste water disposal, Assessments, Pennsylvania.
Identifiers: *Impact analysis, Pittsburgh.

An overview is given of the principal issues encountered during a study of the impacts of the regional sewage collection and treatment system serving the Greater Pittsburgh Area. This study was one part of a research project of the American Society of Civil Engineers titled 'Impact of Civil Engineering Projects on People and Nature'. The purpose of the ASCE study was to identify and study the impacts of several real-world civil engineering projects and programs. The ASCE envisions that, through subsequent planned studies, a methodology can be developed that will aid planners, designers and public officials to predict the probable impacts of civil engineering projects and programs far in advance of development and implementation. The subject of this report is the Allegheny County Sanitary Authority which serves about 1.2 million people in Allegheny County, Pennsylvania. The approaches used and the issues that guided the study and emerged from the study are discussed. The various impacts investigated included upstream impacts, downstream impacts and treatment plant impacts. Investigations undertaken included study of social, economic, political and physical impacts attributable to the development and operation of the Allegheny County Sanitary Authority. Additional studies are needed to identify and analyze the impacts of the Authority to aid in the development of study methodology for analyzing impacts of other types of civil engineering projects. (Poertner)
W74-05241

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
Y. Emsellem.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 197-204 (Chapter 9), 1973.

Descriptors: Water resources development, *Management, *Water supply, Methodology, *Regional analysis, *Comprehensive planning, *Political aspects, Social aspects, Hydrologic aspects, Economics, *River basin development, Cost-benefit analysis, Simulation analysis, Forecasting, Agriculture, Mathematical models, Systems analysis.
Identifiers: *France.

An approach to water resources management is presented which abandons traditional mathematical programming with a unique objective function for a more highly comprehensive procedure. The complete hydrological basin from the source to the sea should be accepted as the basic geographical unit since it is usually an administrative and political unit. When a basin water supply manager hears that water is needed to irrigate an additional million acres, the question is not how to minimize the cost and optimize the benefit, but rather, politically-based, why another million acres should be irrigated. Possible answers are: to produce agricultural goods for domestic consumption; (2) to sell these products abroad; or (3) to create a need for labor. The distribution of charges between activity and group is different from one case to another. The inadequacy of cost-benefit analysis is discussed. A methodology for river basin development being used in France is described. A basic principle is that future water needs depend on the perspectives of regional development (determining economic and social perspectives on the basis of optimum valorization of water resources is possible only when water is scarce, as in arid zones). Four phases of the methodology are distinguished: (1) hypothesis for basin development; (2) forecast model; (3) simulation model; and (4) finance model (evaluates overall cost of each of the preceding solutions). (Bell-Cornell)
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
For primary bibliographic entry see Field 8B.
W74-05091

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
For primary bibliographic entry see Field 5D.
W74-05105

HOW MUCH WILL CLEANUP COST,
For primary bibliographic entry see Field 5D.
W74-05268

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W74-05276

6D. Water Demand

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
F. E. Ellis.
Paper presented at 1st World Congress on Water Resources, Sept 24-28, 1973, Chicago, Ill: International Water Resources Association, Milwaukee, Wisconsin, 1973. 16 p, 3 fig, 4 tab, 13 ref.

Descriptors: *Thermal powerplants, *Coal mines, *Water demand, Industrial water, Water supply, *Central U.S., Great Plains.
Identifiers: Western U.S.

Development of natural resources in the Western United States is dependent upon availability of water supplies. A large potential for the industrial development of eastern Montana, northeastern Wyoming, western North Dakota, and northwestern South Dakota exists in the vast deposits of lignite and sub-bituminous coal within the Upper Missouri River basin. Interest appears to be in using this coal in a dual-energy capacity. It can be converted to electrical energy or synthetic hydrocarbons, gasoline, and natural gas substitutes. Water is necessary to meet this technological development. (Knapp-USGS)
W74-04912

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
N. M. Jackson, Jr.
North Carolina Department of Natural and Economic Resources, Office of Water and Air Resources Publication, July 1973. 255 p, 4 fig, 6 ref.

Descriptors: *Water supply, *North Carolina, Water quality, Water resources, Municipal water, Water sources, Water works, Water distribution(Applied).

Information about the public water supplies in 18 counties in the southern Piedmont section of North Carolina is compiled; this information should be useful to planners and water managers concerned with water-supply availability, water-resources development, and water quality. A water-resources appraisal and a map of each county shows the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. The appraisal includes the population served, the adjacent communities served, the number of metered customers, the source of water, estimated allowable draft, total and industrial water use, raw and finished water storage, raw and finished water-pumping capacity, future plans, a water-resources appraisal in the immediate vicinity of the supply, and the results of chemical analyses of raw and finished water. (See also W74-01040) (Knapp-USGS)
W74-04915

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
For primary bibliographic entry see Field 6B.
W74-04990

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
For primary bibliographic entry see Field 5D.
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W74-05242

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

6E. Water Law and Institutions

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-04853

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W74-04989

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05005

A TREATISE ON CENTRALIZED MANAGEMENT OF WATER RESOURCES,
University of Southern Mississippi, Hattiesburg. Dept. of Economics.
D. C. Williams, Jr., and C. P. Cartee.
In: Watersheds in Transition; Proceedings of Symposium held at Fort Collins, Colo, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 71-76, 1972. 1 fig, 1 tab, 5 ref. OWRR A-041-MISS (2).

Descriptors: *Water management(Applied), *Mississippi, *Planning, *State governments, Federal government, *Governmental interrelations, Political aspects, Organizations, Administration.

Centralized water resource planning at the state level in Mississippi has been an evolutionary process and one that is still not complete. This process has been complicated to some degree by the number, function and organization of federal, state and local agencies involved. The results have been fragmentation, duplication and redundancy in planning, promotion, development and management of water resources. Some of the causative factors leading to this situation and their ramifications are analyzed. A suggested structure of reorganization is also provided for water resource agencies to the state as an alternative to eliminate or alleviate some of the problems. (Knapp-USGS)
W74-05030

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
Y. M. Savvin, and Y. I. Serdyuk.
Typescript 8 p, 1972. Trans. from Gidrotekhnika i Melioratsiya, No 11, 1972.

Descriptors: *Water quality control, *Water utilization, *Irrigation programs, Water resources, *Water management(Applied), Administration, *United States.
Identifiers: *USSR, Technical exchange, Joint research.

During the Moscow meeting in May, 1972 leaders of the U.S.S.R. and the U.S.A. concluded Soviet-American agreements on joint research in the protection of the environment and on collaboration in science and technology. Specific areas of cooperation include water resources management; water quality control; irrigation systems planning and operation; automation and remote sensing as applied to water management; and the utilization of computers for the projection, construction, and management of reclamation systems. An exchange program of technical delegations between the U.S.S.R. and the U.S.A. is described. (Staplin-NWWA)
W74-05076

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
S. D. Clark.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p, 7 ref.

Descriptors: *Regulation, *Management, *Legal aspects, *Water law, *Water policy, Planning, Water resources development, Legislation, *Governments, Groundwater.
Identifiers: *Licensing, Government control, Appeal boards, Protected zones.

Governmental control of groundwater is discussed, beginning with a definition of government as registrar and grantor of rights. The fiscal, social, and political factors influencing management are explored, concluding that only government can put together the necessary capital and human resources to plan, coordinate and execute major water development programs. The development of laws concerning surface water and groundwater is summarized, including factors dictating government control of these resources. An outline of modern groundwater legislation is presented, with special attention to the following: Declaration of State title, licensing of bore construction, licensing of drillers, licensing of extraction and waste disposal, declaration of protected zones, appeal boards, and survey provisions. (Campbell-NWWA)
W74-05082

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Bacon and Thomas, Washington, D.C.
F. B. Francois.
Preprint No 1876, American Society of Civil Engineers, ASCE National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 18 p.

Descriptors: *Water resources development, *Governments, *Political aspects, *Local governments, Political constraints, State governments, Federal government, Legislation, Institutions, Administration, Sanitary engineering, Water supply, Waste disposal, City planning, Regional development, History, Urbanization, Cities.

The need for water has progressed to the point where water resources management is no longer a simple issue to be determined by a select group of individuals. The needs for water have grown, and new forces have entered into the picture to formulate policies for wise use of the limited resources available. Water management in the past was left up to the individual, at first, when private wells supplied the water and privies were widespread. Later, as wells and springs became contaminated, the cities began to enter into the picture of water management. Even so, progress was slow, and sewage treatment facilities were often lacking. The superior political strength of the state governments relative to the cities resulted in some states establishing regional authorities to handle the problems. The federal Government, however, remained largely detached from the entire activity until recently. Now, federal standards are being imposed on local governments as a result of the realization that local governments needed assistance to establish adequate programs. Along with federal standards has come a new approach to the allocation of resources. Social, political, economic and other questions are being added to the scope of the planners' duties. (Poertner)
W74-05235

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04994

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
W. McGrath.
Southern Tier East Regional Planning Board, Binghampton, New York, February 1972. 20 p, 6 fig, 18 ref.

Descriptors: *Rivers, *River basin development, *Land management, *Flood plain zoning, *New York, River regulation, Water pollution control, Comprehensive planning, Water resources development, Floodways, Flood control, Parks, Land use, Land development, Urbanization, Conservation, Recreation facilities.
Identifiers: *Broome County(New York), *Tioga County(New York), Riverbank improvement.

Guided by the initial efforts of the Broome County Planning Department, the Southern Tier East Regional Planning Board has initiated a riverbanks improvement program of preservation and recreational development for Broome and Tioga Counties. The report is a brief description of factors which have influenced the program. Included within this framework is the concept of the program at its inception, current program status, and future program goals and objectives. There are approximately 120 miles of river segments traversing the Broome-Tioga area. Segment lengths range from a seven mile portion of the Delaware River in southeastern Broome County to a sixty mile section of the Susquehanna River which passes through the heart of the most densely populated portions of western Broome and eastern Tioga. In all, five rivers, the Chenango, Delaware, Otselic, Susquehanna, and the Tioughnioga, along with their constituent brooks and creeks, form the drainage basin for the two-county region. Although construction in floodable areas along the rivers has been discouraged by planning officials and municipalities through zoning ordinances, the desired effect has not been achieved. A list is included of the principles and policies established by the Southern Tier East Regional Planning Board. These were adopted in the formation of the Riverbanks Improvement Program for the two-county region. Initial efforts toward acquisition of specific sites along the riverbanks for recreational, educational and conservation uses are mentioned. Various financing programs of federal agencies are listed as possible sources of funds for land acquisition and development of open spaces, parks and conservation projects. (Poertner)
W74-05234

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
A. C. Lardieri.
*Floodproofing, *Building codes, *Legal aspects, Flood damage, Legislation, Design criteria, Regulations, Design standards, Flood protection, Flood plain zoning, Flood control, Floods, Flood stages, Flood plain insurance.

Few building codes require flood-proofing of new or existing structures as a condition for flood hazard area construction or occupancy. Thousands of structures in the United States are located in flood plains and many are partially or totally unprotected from the damages of flooding. Six methods of flood plain management involving non-structural alternatives are: (1) construction of flood protection works such as dams and levees, (2) flood insurance, (3) flood disaster relief, (4) flood plain regulation, (5) government purchase of flood prone land, and (6) flood-proofing. Flood-proofing is the least well known of these methods. It can be incorporated in building codes and complement other approaches to flood control. It is most useful at the fringes of flood prone areas, where the cost of flood-proofing would be minimal, encroachment on the floodway would be negligible, and the threat to life would be minimized. A reference flood level datum should be determined for equitable application of flood-proofing requirements. Regulations should allow for the use of alternative methods of achieving minimum established goals. (Poertner)
W74-05236

6G. Ecologic Impact Of Water Development

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
Copy available from GPO Sup Doc as EP1.23:600/5-73-009, $2.05; microfiche from NTIS as PB-229 574 $1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-73-009, November 1973. 187 p, 6 fig, 4 tab, 217 ref. EPA Program. Element 1HA098.

Descriptors: *Aesthetics, *Environmental effects, Quality control, Decision making, Design standards, Design criteria, *Planning, Federal agencies, Federal reservations, *Regional analysis, *City planning, Scenery, *Research priorities, Management, *Social impact, *Attitudes.

Three primary aspects of the aesthetic concept are discussed: aesthetics and the human senses, aesthetics as thinking about the arts, and aesthetics as the science of beauty. Additional factors underlying the concept of aesthetics include: nature as an underlying force; cultural, social and economic phenomena as determiners of aesthetic expression; and aesthetics of American city life. Aesthetics is also discussed in the context of the National Environmental Policy Act. The following research projects are suggested: (1) Development of criteria for evaluating methodologies designed to assess aesthetic impacts--special emphasis on objectivity, secondary impacts, and aesthetics as an interrelated aspect of all environmental elements. (2) Increased emphasis on user preference studies for understanding individual attitudes and group values about aesthetic characteristics in the environment. (3) Development of aesthetic quality indicators for different levels of concern (national, state-regional, community-local) and devise monitoring techniques. (4) Development of methods for communicating aesthetic effects of changes resulting from planned activities--simulation labs for visual and auditory impacts. (5) Development of an information system for source material on aesthetic research. (EPA)
W74-04987

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
J. R. Huntley.
NATO Information Service: Brussels, Belgium. 1972. 2nd Ed, 62 p, Illus.
Identifiers: Books, Cities, *Environment, Health, Mans, *NATO, Safety, Society, *Water pollution, *Oil spills, *Coastal pollution.

The relationship between man's environment and the Atlantic Alliance is described. The origin of the idea for considering human environmental problems and the establishment of a Committee on the Challenges of Modern Society (CCMS) are discussed. The next section, shaping the human environment, discusses some indicators of problems, why it is an international crisis, and the ecological crisis in advanced nations. The areas in which NATO is working in the environment field: oil spills, coastal water pollution, inland water pollution, the clean engine, air pollution control, the experimental safety vehicle, aspects of road safety, disaster assistance, environment and regional development, scientific knowledge and decision-making, cities, the misuse of drugs, advanced health care, advanced waste water treatment, and environmental fellowships are discussed. A section is then included explaining the reasons why NATO is involved in this undertaking, followed by an explanation of the CCMS concepts and methods. A final section discusses the future of CCMS, including present results and prospects for the future. Three appendixes contain the following information: CCMS chronology, NATO/CCMS publications, and USA/Federal Republic of Germany bilateral agreement on the experimental safety vehicle.--Copyright 1973, Biological Abstracts, Inc.
W74-05027

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
M. D. Campbell, and W. A. Hunt.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p.

Descriptors: Water resources development, Supply, *Water management(Applied), *Planning, *Water demand, *Water requirements, Industrial plants, Feasibility, *Management, Economics.
Identifiers: Private water supplies, Private motives, Government motives, Centralized service, Decentralized service, Contractual service, *Environmental protection.

The need for private water supplies is well established. The subsequent question of when and where private water systems are applicable is discussed. Economic and logistic feasibility are discussed, as well as public health interests, as a function of population density. The private and government motives for developmental and regulatory roles are explored, as well as the comparison between private systems and industrial requirements. Special attention is given to operation and maintenance systems, focusing on the following: implementation, centralized and decentralized service, contractual services, selection of an organizational structure, geography, politics, income level of users, education level and motivation of users, and management. (Staplin-NWWA)
W74-05083

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
For primary bibliographic entry see Field 5D.
W74-05272

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
J. K. Baker, and J. R. Finley.
Water Resources Bulletin, Vol 10, No 1, p 10-21, February 1974. 4 fig.

Descriptors: *Water resources development, *Social impact, *Economic impact, Social values, Employment opportunities, Environment, Psychological aspects.
Identifiers: *Human environment, *Environment impact.

An approach to measuring impacts of water resource developments on the human environment is described. This evaluation system employs a two-step assessment process. The first step is an assessment of the nature and magnitude of the impacts as reflected by parameter value estimates without and with the proposed project. The second step is the determination of overall impact by aggregating the magnitudes of specific impacts in proportion to their respective relative importance, and determining the difference between the aggregated without and with scores. (Knapp-USGS)
W74-05338

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

7. RESOURCES DATA

7A. Network Design

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

7B. Data Acquition

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

PULSED D.C. MOTOR SPEED CONTROL FOR PORTABLE INSTRUMENTATION,
California Univ., Berkeley.
W. W. Schopp, and H. C. Richardson.
Instruments and Control Systems, Vol 46, No 12, p 45, December 1973. 3 fig.

Descriptors: *Instrumentation, *Monitoring, Pollutant identification.
Identifiers: *Pulsed DC speed control, Motors, Speed control, Controllers.

Many environmental testing instruments require that air be moved at a given rate through a filter for a specific time. This filter is then removed, and the pollutants that have been collected are measured. Most of these instruments use a blower powered by a small DC motor whose speed must be adjustable in order to calibrate the instrument. Many units are designed for portable field use, operate on batteries and use a power consuming series dropping resistor to alter the speed of blower motor. An effective speed control can be implemented by generating a square wave at a constant frequency and varying the duty cycle of the square wave. Additionally, removal of the series resistor increases the motor torque at the slower speed. The design uses a 24-volt DC motor. The pulsed DC speed control is designed around an inexpensive integrated circuit (IC) timing module with a base frequency of 250 kHz. The output pulse train is fed to the base of the Darlington connected transistors. Motor requirements up to 1 A may be handled. A resistor reduces the 24-V motor supply to 12 V for use with the IC, and may be removed if a 12-V supply is available. This control may be used for DC motors with current requirements up to 400 mA. (Mortland-Battelle)
W74-04895

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
P. G. White, K. R. Jenkin, R. C. Ramsey, and M. Sorkin.
Available from NTIS, Springfield, Va 22151 NASA CR-2311, Printed price $4.75 domestic, $7.25 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2311, October 1973. 167 p, 101 fig, 14 tab, 5 ref. NASA contract NASI-10918.

Descriptors: *Remote sensing, *Spectrometers, *Oceanography, Instrumentation, Data processing, Data collections, *Chlorophyll, Pollutant identification.

Identifiers: Radiometry, *Spectroradiometers.

An imaging spectroradiometer (Multichannel Ocean Color Sensor) was designed, developed and flight tested. Computer routines were developed specifically for the program. These included routines to calibrate the data, convert units, plot spectra from specified points in the target area, apply algorithms to identify different types of matter in the water, and generate maps showing variations in the distribution of these algorithm values over the target areas. These maps can be prepared in false color, as density plots, or as contour plots. Data were obtained from both east and west coasts of the United States, the coast of Africa, the Canary Islands, the Gulf Stream, the Bahamas, and the Gulf of Mexico, as well as some freshwater lakes. Differences in chlorophyll concentrations less than 0.1 mg per cu m were readily detected and mapped from an altitude of 11,100 m. (Knapp-USGS)
W74-05026

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 2B.
W74-05126

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W74-05169

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
For primary bibliographic entry see Field 5B.
W74-05179

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
For primary bibliographic entry see Field 5A.
W74-05297

POTENTIOMETER RECORDERS.
Measurements and Data, Vol 7, No 6, p 62-71, November/December 1973. 2 fig.

Descriptors: *Potentiometers, Resistivity, Specifications, Electronic equipment, Design standards.
Identifiers: *Recorders, Servomotors.

Null-balance recorders are servo-operated devices generally referred to as 'Potentiometers.' The advantages of the null-balance potentiometer are (1) high sensitivity, down to microvolt signals, and (2) independence of lead length. Nearly all process and test variables can be measured in terms of microvolt or millivolt electric signals, and often must be measured at large distance from the point of recording. The potentiometer recorder meets these needs. Further, the potentiometer can be used with minor modifications as a null-balancing bridge-input recorder, which is basically a resistance (or inductance or capacitance) measuring device. A departure from standard servo recorder design is the 'Speed Servo' with a response speed faster than potentiometer recorders which use servomotors, geartrains and cable or cord pen drive. In the 'Speed Servo' strings, pulleys, belts, gears and rotary servomotor are replaced by a servomotor whose armature operates back and forth like a shuttle. This armature features drive coil allowed to slide freely along the pole piece in a magnetic field (produced by the permanent magnet). Current in the drive c coil horizontally. Specifications (channels, FS response, comments, and prices) are given for potentiometers from 69 different suppliers. (Mortland-Battelle)
W74-05298

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
R. Jones, and C. J. S. Stuart.
Limnology and Oceanography, Vol 18, No 5, p 805-809, September 1973. 2 fig, 4 ref.

Descriptors: Freshwater, Chemical analysis, *Water sampling, Water analysis.
Identifiers: *Sampling equipment, *Water sampler.

A freshwater sampler is described having three evacuated glass tubes which fill simultaneously at the selected depth when each rubber sealing stopper is pierced by a hypodermic needle. Each tube acts as the sample collector and container. (Holoman-Battelle)
W74-05321

7C. Evaluation, Processing and Publication

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

APPROXIMATING DISCRETE DISTRIBUTIONS, WITH APPLICATIONS,
California Univ., Riverside. Dept. of Statistics.
D. V. Gokhale.
Journal of the American Statistical Association, Vol 68, No 344, p 1009-1012, December 1973. 14 ref.

Descriptors: *Statistical methods, *Probability, Analog models, Algorithms.
Identifiers: *Discrimination information, Probability distribution, Contingency tables.

A generalized procedure is presented of finding the discrete distribution which minimizes, subject to a set of linear constraints on the probabilities, the 'discrimination information' with respect to a given probability distribution. A convergent iterative algorithm is modified to serve this purpose. Many applications are discussed including analyses of contingency tables and some discrete analogues of the one-sample and several-samples problem. A test for the validity of the imposed constraints is provided by a test-statistic distributed asymptotically like a chi sq
W74-04892

BAYESIAN ANALYSIS OF A BIVARIATE NORMAL DISTRIBUTION WITH INCOMPLETE OBSERVATIONS,
Temple Univ., Philadelphia, Pa. Dept. of Mathematics.
J. S. Mehta, and P. A. V. B. Swamy.
Journal of the American Statistical Association, Vol 68, No 344, p 922-927, December 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Statistical methods, Average, Distribution, Estimating, Equations, Statistical models.
Identifiers: *Bayesian analysis, *Bivariate normal population, Inferences, Data interpretation, Nuisance parameters, Incomplete observations, Difference of means.

A specific problem of making inferences about the difference of the means in a bivariate normal population is considered when the sample has some missing values corresponding to one or both variables. The purpose of the study was to evaluate the effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means. A Bayesian solution to the problem is offered. One advantage of the Bayesian approach is that the nuisance parameters can be eliminated by straightforward integration. The effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means can be evaluated by analyzing the marginal posterior distribution of the difference of the means which incorporates a proper allowance for the roles of the nuisance parameters in the model. (Mortland-Battelle)
W74-04893

MAXIMUM LIKELIHOOD ESTIMATION FOR MIXTURES OF TWO NORMAL DISTRIBUTIONS,
Colorado Univ., Denver. Medical Center.
N. P. Dick, and D. C. Bowden.
Biometrics, Vol 29, No 4, p 781-790, December 1973. 2 fig, 2 tab, 16 ref.

Descriptors: *Distribution patterns, *Probability, *Monte Carlo method, Average, Fisheries, Estimating, Size, Fish.
Identifiers: Variance, Hessian matrix, Normal distribution, Sample size, Maximum likelihood, Data interpretation, Difference of means, Mixtures.

Primary concern is focused on estimation of the parameters mu 1, rho 1 squared, mu 2, rho 2 squared, and p in the mixture of two normal distributions when independent sample information is available from one of the populations. The solution to the maximum likelihood (ML) equations was obtained using Newton's iterative method. Some interesting results for the moment estimates were obtained for the case when independent sample observations are available from one population. Extensive Monte Carlo simulation was employed to obtain the sample variances of the estimates as well as the estimated asymptotic variances. The variances of the estimates are influenced by the separation of the two means with respect to the variances, the mixture proportion (p), and, of course, the size of the sample. When the number of observations is small and the means

are not well separated, the sample variance of the estimates can be as much as three times greater than the estimated asymptotic variances. The problem motivating this research originated in fisheries where it was necessary to estimate the average lengths of the two separate plants of fish after one year, the population variances of the lengths, and the mixture proportion using the entire sample. (Mortland-Battelle)
W74-04898

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
For primary bibliographic entry see Field 5A.
W74-04899

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England). National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England). National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04910

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 2B.
W74-04921

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
1973. 45 p, 2 fig.

Descriptors: *Hydrologic data, *Data collections, Planning, Data processing, *Data storage and retrieval, Federal government, Water resources development, *Water quality standards, Baseline studies.
Identifiers: *Willamette River.

Members of the Advisory Committee were in general agreement that the Office of Water Data Coordination had done a good job during the past year of keeping them informed of developments in the resources and environmental information fields. Suggestions made during the general discussion which followed included: that the Geological Survey give serious consideration to establishing a closer working relationship between Federal water-data-collection agencies and those of the States; that consideration be given to holding joint meetings of the Federal Advisory Committee on Water Data and the Advisory Committee on Water Data for Public Use; and that State water-data programs be strengthened, and Federal and State efforts in the area of water-data collection and dissemination be blended into a single national effort. During the discussion the increasing need for environmental baseline data was stressed. A session was devoted entirely to a presentation and discussion of the pilot study, Intensive River-Quality Assessment of the Willamette River. (Knapp-USGS)
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 4B.
W74-05120

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05125

ON THE AUTOMATIC COMPUTATION OF GEOELECTRIC SOUNDING CURVES,
Indian Inst. of Tech., Kharagpur.
R. K. Sarkar, and H. P. Patra.
Indian Hydrology, Vol 9, No 1, p 38-45, June 1973. 4 fig, 6 ref.

Descriptors: *Data processing, *Geophysics, *Electrical studies, Simulation analysis, Resistivity, Conductivity.

An algorithm is given for the construction of synthetic geoelectric sounding curves. The method presented is simple and fast, and can be operated with slower computers. Given the preliminary results of interpretation of resistivity sounding field data, the synthetic curves may be generated with the help of a digital computer with a prescribed accuracy limit. This serves as a check on the results of preliminary interpretation, and thus forms an integral part of geoelectric data interpretation. (Knapp-USGS)
W74-05129

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W74-05138

FOCAL ON THE PDP-9 COMPUTER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
S. H. Whitlow.
Report Series No 24, 1973. 16 p, 11 ref, append.

Descriptors: *Digital computers, *Computer programs, *Programming languages, *Data processing, Hydrologic data, Canada.

In the Water Science Subdivision of the Canadian Inland Waters Directorate, the PDP-9 computer is used for a variety of scientific calculations. These include analysis of X-ray diffraction, viscosity, density, conductivity, and chromatographic experiments. Often results are needed quickly for calibration purposes or as parameters in subsequent experiments; alternately, mathematical analysis may be used to derive final results and to establish statistical criteria. Much of the data processing is done by means of programs written within the Subdivision and it is anticipated that some of these computer programs of general interest will be described in a future report. This report is designed to be an operating guide for running user programs on the Water Science Subdivision PDP-9 digital computer. It is to permit users with little or no computer background to run simple programs using the FOCAL (FOrmula CALculator or Formulating On-line Calculations in Algebraic Language) conversational language. Operating procedures have been gathered from various sources and are combined with techniques developed through usage to provide step-by-step direction. A new external function, FDRA, is described which adds a straight line display capability to FOCAL. Directions are given to utilize this feature in user programs and an example, 'Least-squares fit with scope display', is provided. (Knapp-USGS)
W74-05151

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
A. H. Truesdell, R. O. Fournier, and J. M. Thompson.
Available from NTIS, Springfield, Va 22151 PB-220 732; Price $3.00 printed copy; $1.45 microfiche. Computer Contribution USGS-GD-73-014, 1973. 9 p.

Descriptors: *Hot springs, *Mixing, *Water temperature, Geochemistry, Hydrogeology, Water chemistry, Silica.
Identifiers: Hydrogeochemistry.

Some warm (<80 dec C) springs originate from the subsurface mixture of hot and cold water. This computer program calculates the fraction and temperature of the hot water component from the temperature and silica contents of the warm spring and of normal cold springs of the area. (Knapp-USGS)
W74-05156

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
For primary bibliographic entry see Field 3F.
W74-05213

REGIONAL ENVIRONMENTAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla.
For primary bibliographic entry see Field 5B.
W74-05239

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

8. ENGINEERING WORKS

8A. Structures

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
J. S. Gardner, and N. B. Hultquist.
Available from National Technical Information Service as PB-228 644 $16.50 in paper copy, $1.45 in microfiche. Iowa State Water Resources Research Institute, Iowa State University, Ames, Iowa. Report ISWRRI-58, December 1973. 258 p, 17 fig, 32 tab, 140 ref, append.

Descriptors: Dams, Environment, Floods, *Flood control, Land use, Reservoirs, Iowa, *Social impact, Ecology, *Social change, Recreation, Attitudes, *Environmental effects, *Post-impoundment.
Identifiers: Coralville reservoir(Iowa), *Iowa River(Iowa).

Human ecological impacts of the Coralville Dam and Reservoir, a flood control structure on the Iowa River, Iowa are described. Impacts include agricultural and urban land use changes, recreation participation growth, changes in stream hydrology, erosion, debris and problems associated with prolonged, controlled outflows from the dam and high water levels in the reservoir, and a number of indirect effects of these changes. Development of the project and the changing nature of concerns, conflicts and impacts over time are reviewed. Perceptions of floods and flood control are examined in a sample population along the Iowa River and the results compared with those on the Cedar River, an uncontrolled stream and the Des Moines, a recently controlled stream. Particular attention is directed to the flood of 1973. Prolonged and high outflows from the dam have produced downstream flooding on agricultural land. Resulting conflicts between farmers and the Corps of Engineers over the flood control structure and its operation have lessened its beneficial image at the local level. The research indicates careful attention should be directed to scale of impact, dynamics of impact, zone or location of impact, socio-economic distribution of impact and components of impact, in environmental and human ecological analyses.
W74-04856

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
For primary bibliographic entry see Field 5F.
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
For primary bibliographic entry see Field 5F.
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
P. K. Swamee, and P. Khanna.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EEI, Proceedings paper No 10375, p 93-99, February 1974. 1 fig, 21 equ, 6 ref.

Descriptors: *Economics, *Environmental engineering, *Water distribution(Applied), *Water supply, *Networks, Optimization, *Pipes, Mathematical models, Systems analysis,
Identifiers: Equivalent length approach, Equivalent diameter approach.

A simple water supply loop has been optimized by lag-range-multiplier method. The equivalent length and equivalent diameter approaches for optimizing the same loop, and for water distribution network optimization in general, are critically examined, and the inherent fallacies are considered. The problem of minimizing water network cost reduces essentially to the optimization of a nonlinear objective function subject to nonlinear constraints involving nonanalytical functions. The problem in its original form is unsolvable by known mathematical techniques. Attempts to obtain optimal solution have been either through simplification of the physical problem via certain assumptions, or through the use of objective functions based on equivalent pipe concepts. This paper examines the latter approach to optimization of pipe networks. This approach towards optimization of water networks is based upon knowledge of the pressure surfaces a priori. (Bell-Cornell)
W74-05383

8B. Hydraulics

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
H. G. Wenzel, Jr.
Available from National Technical Information Service as PB-228 661 $7.00 in paper copy, $1.45 in microfiche. University of Illinois Water Resources Center Research Report No 74, 1973, 65 p, 25 fig, 4 tab, 20 ref, 2 append. OWRR B-063-ILL(2). 14-31-0001-3581.

Descriptors: *Pipe flow, Instrumentation, *Venturi meters, *Flow measurement, Discharge measurement, Urban drainage, Open channel flow, Design criteria, Performance, Optimization.
Identifiers: *Sewer flow, *Flow meter.

An experimental and analytical study was performed to develop the geometry for a Venturi type flow meter for use in sewer flow measurement. The meter consists of a constriction in the pipe which produces critical flow under open channel flow conditions and acts as a conventional Venturi meter under full flow conditions. The constriction is constructed using cylindrical segments whose diameters are larger than that of the pipe and which are attached to the sides of the pipe, leaving the invert and crown clear. Head loss characteristics and experimental rating curves for both open channel and full flow conditions are described. A procedure is presented, based on experimental data, to theoretically construct a rating curve if experimental calibration is impractical. Information is also presented to permit the selection of geometrical parameters for optimum performance for a specific installation.
W74-04857

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
R. L. Miller.
Available from NTIS as AD-676 312 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 8, prepared for the Office of Naval Research, June 1968. 47 p, 12 fig, 25 ref. Nonr-2121(26).

Descriptors: *Bores, *Waves(Water), *Shallow water, Slopes, Beaches, Aeration.
Identifiers: Long wave theory, Progressive waves, Breaking waves, *Run-up, *Wave run-up.

The run-up of undular surge and bore is determined experimentally, for four slopes each with 3 different bottom roughnesses. The run-up is strongly affected by both slope and bottom roughness. Experimental data on run-up, and changes in structure and celerity of the wave front during progression up slope, disagree in several fundamental aspects with presently published rele-

vant theory based on the non-linear long wave equations. Photographic evidence is presented of two related phenomena in the higher Froude number ranges of the fully developed bore. These are (a) the generation of large eddies which appear to form at the bore face and progress with decreasing diameter toward the rear of the bore, and (b) the associated inclusion of air into the internal portion of the bore (aeration). (Sinha-OEIS)
W74-04936

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. C. Shen.
Available from NTIS as AD-646 509 for $6.00 paper copy, $1.45 microfiche. Research Report No. 2-5, June 1965. 123 p, 49 fig, 1 tab, 33 ref, 2 append.

Descriptors: *Harbors, Model studies, *Tsunamis, *Bores, *Shallow water, Bays, Coasts, *Hawaii, *Hydraulic models.
Identifiers: Hilo Harbor(Hawaii), Bore generator.

Theoretical and experimental investigations were made of the generation of a bore by the three following types of bore generator: (a) piston type, (b) gate type, and (c) pneumatic type. The analyses were based on nonlinear shallow-water theory incorporated with bore conditions. The experiments were conducted in a test flume 1 ft wide and 40 ft long. Explicit solutions were obtained for the height, duration, and length of bores generated by each type of generator. The bore heights found experimentally agreed very well with the theoretical predictions. A numerical computation of the pneumatic chamber theory was also performed and showed remarkable agreement with test results of the pneumatic-type bore generator. A uniform slope of 3 percent was installed in the test flume to investigate the bore motion over a uniform slope. The bore transformation was found to agree with Whitham's approximate solution. The bore runup reached a height above still-water level 2.6 to 3.0 times greater than the initial height of the bore on the flat bottom. The breaking of the bore during its transformation was also studied. Due to its inexpensiveness and versatility, a pneumatic-type bore generator was recommended for use in the model of Hilo harbor, Hawaii for investigation of tsunami-wave attack at Hilo. (Sinha-OEIS)
W74-04946

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
D. Divoky, and J. Lane.
Final Report No. TT-P-282-73-1, prepared for Office of Naval Research, April 1973. 53 p, 30 fig, 1 tab, 7 ref. N00014-72-C-0366.

Descriptors: *Bays, *Bores, *Harbors, *Beaches, Landslides, *Coastal structures, *Waves(Water), Explosions, *Shore protection.
Identifiers: *Edge bores, Edge waves.

In an experimental test program, the wave height variation along a crest, from deepwater to shore, received primary attention. It was found that under certain conditions the wave height near shore could be as much as five times the offshore height. Such wave amplification is possible at the beach even in the case of zero angle of incidence. Empirical prediction rules were derived. In an edge bore the onshore segment travels at the offshore speed; large lateral flow continually replenishes losses in the edge bore breaking region; the crest is not refracted over the abrupt depth changes. While the offshore segment is limited in height by the offshore depth, the nearshore segment may in fact be of even greater height depending upon beach slope and angle of incidence. The practical importance of the edge bore phenomenon is that shoreline installations can be subjected to waves of very great height when the usual expectation might be only small waves. (Sinha-OEIS)
W74-04948

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
J. B. McAleer.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 42, p 660-685, 1964. 12 fig, 16 ref.

Descriptors: *Hurricanes, *Shore protection, *Rhode Island, *Coastal engineering, *Surges, Flooding, Coasts, Mathematical models, *Bays, Hydraulic models.
Identifiers: Narragansett Bay(RI).

Hurricane flooding has emerged as one of the major coastal engineering problems of the Atlantic and Gulf Coast areas of the United States. Engineering and scientific investigations have been made to determine the fundamental mechanics of the hurricane surges that cause inundation of coastal areas and to develop practical and economical protection. Mathematical models and large hydraulic models were used for the Narragansett Bay studies of two major projects. The discussions presented are limited to the hydraulic studies of barriers at the mouth of the bay, known as the Lower Bay Barrier Plan, and the Fox Point Hurricane Barrier which is now under construction. (Sinha - OEIS)
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

ENLARGEMENT OF THE CHESAPEAKE AND DELAWARE CANAL, HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
M. B. Boyd, W. H. Bobb, C. J. Huval, and T. C. Hill.
Available from NTIS as AD-768 779, $6.25 in paper copy. Technical Report H-73-16, October 1973. 436 p, 18 fig, 4 tab, 22 ref, 243 plates.

Descriptors: *Hydraulic models, *Mathematical models, Delaware River, Chesapeake Bay, *Canals, *Canal construction, Tidal effects, Density currents, Salinity, *Coastal engineering.

Enlargement of the sea-level C and D Canal connecting Chesapeake Bay and Delaware River from 27 by 250 ft to 35 by 450 ft, undertaken in 1954, was essentially complete by 1970 except for about a 2-mile reach at the Delaware River end. Concern about effects of the enlargement on the environmental and biological systems led to the decision to leave the unimproved reach intact, pending completion of extensive environmental studies. This report is concerned with the model studies. The existing Delaware River model was extended to include the 27- by 250-ft C and D Canal and Elk River and the propagation of tides and currents in the addition was verified. Tides, currents, salinities, and discharges were then measured for various head differentials across the canal. The canal was first enlarged to existing conditions (35 by 450 ft, except for the unimproved reach at the Delaware end) and subsequently to project conditions and comparative measurements were made. The critical phenomena affecting flow in the canal is head differential across the canal produced by Chesapeake Bay tides at the western end and Delaware River tides at the eastern end. The canal is a very dynamic system and can experience large differential changes daily. Net flow is toward the lower tide level and enlargement from 27 by 250 ft to August 1972 conditions caused net flow to be increased by a factor of about 4.8 and completion of enlargement will cause additional increases. Dye dispersion tests were made for 27 by 250 ft and completed canal conditions and a mean differential. An existing numerical model based on the one-dimensional unsteady flow equations was used for initial studies concerning net flow changes due on the enlargement. (Sinha - OEIS)
W74-05036

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT SANTA MONICA BAY, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
C. E. Chatham, Jr., D. D. Davidson, and R. W. Whalin.
Available from NTIS as AD-765 433, $4.50 in paper copy. Technical Report H-73-8, June 1973. 131 p, 18 tab, 20 ref, 1 append, 24 photos, 14 plates.

Descriptors: California, *Hydraulic models, *Coastal engineering, Beaches, Rip currents, Sediment transport.
Identifiers: Perched beaches, Freeway locations, Rubble mound structures.

Hydraulic models were studied in determining the technical feasibility and optimum design factors of the perched beach concept for widening the existing beach to provide right-of-way for a freeway along a portion of the Santa Monica Bay coastline. The following parts of the study were completed: (a) An undistorted, three-dimensional, fixed-bed model (scale 1:100) was used to determine the effect of the perched beach on rip currents. If adverse interactions were found to be present, the model was to be used to determine means of minimizing them. (b) A distorted-scale (1:100 horizontal, 1:50 vertical), two-dimensional, movable-bed model was used to estimate the amount of sand which might be lost seaward over the toe structure due to normal and storm wave actions and to determine the optimum crown elevation of the submerged structure and the length of stone riprap apron required to reduce the seaward migration of sand to a minimum. (c) An undistorted, two-dimensional model (scale 1:30) was used to determine the structural design of the proposed rubble-mound toe structure for various depths. (Sinha - OEIS)
W74-05039

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
For primary bibliographic entry see Field 8G.
W74-05081

THE INTERPRETATION OF INTERFERENCE TESTS IN NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 8G.
W74-05086

PRESSURE INTERFERENCE EFFECTS WITHIN RESERVOIRS AND AQUIFERS,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 4B.
W74-05087

THE SKIN EFFECT IN PRODUCING WELLS,
W. Hurst, J. D. Clark, and E. B. Braver.
Journal of Petroleum Technology, Vol 21, No 11, p 1483-1489, November, 1969. 7 fig, 2 tab, 7 ref.

Descriptors: *Flow rates, *Inflow, *Permeability, *Wells, Boreholes, Fluid flow, Laplaces equation, Oil reservoirs, Pressure, Mathematical model.
Identifiers: *Skin effect, Positive skin, Negative skin, Pressure drop, Cumulative production.

The change in permeability in the zone around the wellbore is called the skin effect. If the permeability in the skin zone is less than that of the formation the skin is positive; if greater, the skin is negative. If the two permeabilities are equal, there is no skin. Van Everdingen and Hurst have given mathematical solutions to the case of a zone of reduced permeability around the wellbore by treating the positive skin as a zone of reduced permeability of infinitesimal thickness. In calculating negative skin by this approach mathematical difficulties arise. These can be overcome by assuming an enlarged wellbore radius and using the same equations that apply for positive skin. The cumulative fluid influx into a well was calculated for positive and negative skin values of 0, 2.5, 5, 10, 15, 25, and 50, and for dimensionless time ranging from 100 to 10,000,000. With increase in positive skin the fluid influx is decreased. The larger the absolute value of a negative skin, the greater the apparent wellbore radius and the cumulative fluid influx into the well at any given time. (Gray-NWWA)
W74-05088

INTERPRETATION OF BOUNDARY EFFECTS FROM PUMPING TEST DATA,
Geological Survey, Trenton, N.J. Groundwater Branch.
S. M. Lang.
Journal American Water Works Association, Vol 52, No 3, p 356-364, March, 1960. 6 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, *Wells, *Boundary processes, *Pumping test, Hydraulics, *Hydraulic models, 8theis equation.
Identifiers: Theis nonequilibrium formula, Image well model, Inverted image well model.

The hydraulic characteristics of an aquifer of infinite areal extent and of uniform permeability that define its abilities to store and transmit water are generally determined from the analysis of pumping test data by means of various formulas. The nonequilibrium formula developed by Theis is reviewed. A modification is presented of the Theis formula to extend its application to situations in which the pumped formation is adjacent to another formation of a vastly different transmissibility and the boundary between the formations approximates a straight line. Image and inverted image well models are discussed. (Campbell-NWWA)
W74-05089

CORROSION CONTROL SPEEDS UP,
Clark, Dietz and Associates, Urbana, Ill. Environmental Engineering Section.
For primary bibliographic entry see Field 8G.
W74-05090

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
M. D. Campbell.
Water Well Journal, Vol 27, No 6, p 41-44, June 1973.

Descriptors: Wells, *Water wells, Economics, *Cost analysis, Bids, Appraisals, *Construction costs.
Identifiers: *Well cost analysis, Guarantees.

Obtaining a safe and sanitary water supply of adequate quantity to satisfy the owner demands proper well cost analysis. A determination of water needs is a first step, followed by selecting a proper design to assure a sanitary supply. Factors to keep in mind when selecting a contractor are reviewed: reputation of contractor with previous customers, condition and type of equipment he uses, and contractors' design suggestions and guarantees offered. Comparing costs can be more effective by giving attention to the following questions: What capacity is desired; what well-life is desired; what well system efficiency is desired; what quality of well construction and completion will the customer accept. (Staplin-NWWA)
W74-05091

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
For primary bibliographic entry see Field 8G.
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
R. Goldsmith.
The Oil and Gas Journal, Vol 70, No 45, p 66-70, November 6, 1972. 5 fig, 1 tab, 6 ref.

Descriptors: *Laminar flow, *Flow resistance, Hydraulics, *Pressure, *Pumping, Viscous flow, Viscometers, Rheology, Muds, Drilling fluids, Gels.
Identifiers: *Annular circulative pressure, Plastic, Viscosity, Yield point, Initial gel strength, Rheometer.

A graphical method is a convenient means for the calculation of laminar pressure losses of time-independent non-Newtonian fluids in pipes and annuli. This procedure does not require an arbitrary model relating shear stress and shear rate. Measurements commonly made in the field are used. A smooth curve is drawn through the viscometer dial readings at 600 rpm, 300 rpm and the initial gel strength. The circulating pressure at various pumping rates can be read from the graph by referring to the applicable borehole-drill pipe combination. The effective increase in mud weight corresponding to the annular circulating pressure can be read from the chart. Examples are given of the use of the chart. (Gray-NWWA)
W74-05096

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
S. V. Spiridonoff.
Journal American Water Works Association, Vol 56, No 6, p 689-698, June 1964. 4 fig, 1 tab, 13 ref.

Descriptors: *Groundwater, *Wells, *Design, Construction materials, Yield, Caissons.
Identifiers: *Radial collector wells.

Radial collector wells are horizontal perforated conduits that intercept and collect ground water derived principally from surface water infiltration. Such supplies are usually found in the sand and gravel deposits underlying and hydraulically connected with surface sources, such as rivers, lakes, or oceans. Discussed are design details, construction methods, expected yield, limitations, and typical installations of radial collector wells. This type of well enables a large area of an aquifer to be exploited, and the unrestricted access and independent control of each collector pipe permits easy regulation of flow into a caisson and inspection and backwash of the collector pipe. (Staplin-NWWA)
W74-05098

ACQUISITION AND ANALYSIS OF DATA FOR OPTIMIZED DRILLING,
Amoco Production Co., Tulsa, Okla.
J. L. Lummus.
Journal of Petroleum Technology, Vol 23, No 11, p 1285-1293, November 1971. 8 fig, 5 tab, 4 ref.

Descriptors: *Optimization, *Computer programs, *Drilling, *Drill monitors, *Well data, Data processing, Drilling equipment, Drilling fluids, Rotary drilling, Mud, Hydraulics, Cost analysis, Well casings, Blowouts.
Identifiers: 'Op Drilling' program, Drilling variables, Drill bits, Drilling rate.

The first step in preparing an optimized drilling program is to organize the data needed for computer input to calculate optimum values for the controllable drilling factors. The mud program is begun with the selection of the type of drilling fluid as determined by local conditions and experience in the area. The drilling equipment is analyzed to determine if additional mud-handling facilities are needed to maintain a low-solids mud. The hydraulics program is then generated, taking into account the mud, hole size and casing program, drill string and bottomhole assembly, limits of rig horsepower, pump pressure and capacity, and drillability of formations to be penetrated. Selection of the type of bit, rpm and weight on bit may be based on bit records and logs but will be modified as indicated by 'drill off' tests. Blowout control assistance consists of examples for instruction, well control tables and, by telephone, a well-kick model on a time-sharing computer system. As drilling progresses, the program is revised as required by analysis of daily performance and unexpected problems. The most effective method is to have a monitoring unit and computer at the rig. Lacking the computer at the drill site, the summarized information can be transmitted to a central location for analysis by specialists in drilling engineering. Computer-drawn plots permit examination of 23 variables. Usually, however, only six important variables are reviewed in a detailed analysis of the optimized program. (Gray-NWWA)
W74-05099

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05101

CONTROLLED SOLUTION MINING IN MASSIVE SALT,
Texas Univ., Austin.
G. F. Sears, and F. W. Jessen.
Society of Petroleum Engineers Journal, Vol 6, No 2, p 115-125, June 1966. 11 fig, 2 tab, 8 ref.

Descriptors: *Storage capacity, *Leaching, *Underground storage, *Mining, Sodium chloride, *Computer programs, *Salts, Storage, Aqueous solutions, Solvent extraction, Pumping.

Identifiers: Massive salt, Salt domes, Solution-control blanket, Storage cavity, Fortran, Dissolution process.

The creation of underground storage cavities for natural gas and liquified gases by dissolving salt involves consideration of the shape of the cavity, the volume of the controlling blanket (oil, gas or air), the rate at which the salt is being removed, the area in the cavity undergoing solution, and the total time required at any point in the development of the planned configuration. The vertical height of the blanket/water interface can be detected by electrical or optical means. The other variables can be related to this independent variable. Equations are given to allow calculation of the total mass removed, the quantity of blanket material necessary to achieve the desired shape, and a computer program is proposed. Results are given for three cavity shapes, showing graphically the total volume removed and the rate of removal of salt as a function of time. A controlled solution mining program for a 100-ft vertical diameter solid conic in massive salt is shown in tabular form. (Gray-NWWA)
W74-05103

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
R. W. Hornbeck.
Available from GPO, Washington, D.C. 20402, Price $3.60, Stock No. 3300-0430. National Aeronautics and Space Administration Report SP-297, 1973. 339 p.

Descriptors: *Heat transfer, *Mixing, *Numerical analysis, *Flow, Open channel flow, Jets, Boundary layers, Convection, Pipe flow, Laminar flow, Equations, Mathematical studies, Mathematical models.
Identifiers: *Marching procedures(Mathematical).

Finite difference formulations and methods of solution are given for a wide variety of fluid flow problems with associated heat transfer. The use of the term marching technique applies to any numerical method of solving an initial value problem. The term is thus applied equally to implicit and explicit techniques for the solution of parabolic and hyperbolic differential equations. Typical problems of this type are those which include any arbitrary distribution of suction or injection at a body surface, body forces such as MHD or EHD forces, any class of variable properties including those in which tabulated property variations must be used, and any type of velocity or temperature boundary condition including convection, jets, variable boundaries, and open channel flow. In the appendixes a number of topics are discussed which are of interest with respect to finite difference equations. These include a very rapid method for solving certain sets of linear algebraic equations, numerical stability, the inherent error in flow rate for confined flow problems, and a method for obtaining high accuracy with a relatively small number of mesh points. (Knapp-USGS)
W74-05128

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W74-05134

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-05170

8C. Hydraulic Machinery

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
N. Abramov.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p M3-M20 (1969). 7 fig.

Descriptors: *Water supply, *Pumping, *Pumped storage, *Distribution systems, *Automation, *Electric power, Optimization, Water utilization, Economics, Zoning.
Identifiers: Booster stations, Computer control, Telesignalling, *Moscow water supply system.

It is of great economic importance to find ways of reducing the power consumed in pumping water in urban water mains. There are various ways in which this reduction can be achieved, and they may also contribute significantly to reducing water pumping costs. They include the following: rational selection of number, capacity and location of pumping stations; rational selection of capacity and location of pressure regulating (storage) reservoirs; rational zoning of water supply systems, i.e. subdivision into zones for individual groups of consumers, depending on the geographical relief of the locality and the pressure heads required; control of the operation of individual pumping sets and of pumping stations as a whole when they operate together in a system, in order to achieve optimum conditions that minimize unproductive power consumption; and the use of pipes of relatively low head loss and their maintenance in service. Achieving optimum operating conditions in water supply systems in service is also aided by automatic control of system operation using telesignalling, automatic control and computer control. (Campbell-NWWA)
W74-05093

8G. Materials

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
C. M. Barton.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resources', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 14 p, 2 fig, 11 ref.

Descriptors: *Sampling, *Cores, Drilling samples, *Hydrologic data, Soil analysis, Economic feasibility, Aquifer characteristics, Boreholes.
Identifiers: *Borehole sampling, Piston sampler, Open drive sampler, Jet sampler, Extension flap sampler, *In-situ freezing, *Pressure-dewatering, Chemical stabilization.

An outline review of borehole sampling of loose sandy materials for hydrological and water well design purposes is presented. Both standard exploration sampling procedures and more precise special techniques are discussed. A great variety of samplers are described, including open drive samplers; piston samplers (retractable, floating, and fixed); jet samplers; and extension flap samplers. In example circumstances, particularly for uncemented or poorly cemented gravels, it may be necessary to stabilize the strata prior to sampling. Consideration can be given in these cases to in-situ freezing, pressure-dewatering, or chemical stabilization of the strata to produce a truly representative and undisturbed sample. (Hunt-NWWA)
W74-05081

CATHODIC PROTECTION, CONTROL OF EXTERNAL CASING CORROSION,
Shell Oil Co., Midland, Tex.
M. T. Chapman.
Materials Protection and Performance, Vol 12, No 9, p 4-12, September, 1973. 8 fig, 10 ref.

Descriptors: *Wells, *Casing, Corrosion, *Corrosion control, *Cathodic protection, Anode, Cathode, *Texas.
Identifiers: *External corrosion, Rectifiers, Ground beds, Cathodic interference.

External corrosion of well casings, which can cause the loss of a well, has occurred in many areas of the United States. West Texas, a major problem area, has several thousand wells under cathodic protection, the only way to effectively combat external casing corrosion. Amperages needed for protection vary from 1 to as many as 50 amps, and the cost can vary from $3000 to $100,000 or more. Methods for determining the extent of corrosion are discussed, and detailed information on the design and installation of cathodic protection systems is presented. (Staplin-NWWA)
W74-05085

THE INTERPRETATION OF INTERFERENCE TESTS IN NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
H. Kazemi, M. S. Seth, and G. W. Thomas.
Society of Petroleum Engineers Journal, Vol 9, No 4, p 463-472, December, 1969. 2 fig, 18 ref.

Descriptors: *Fractures(Geologic), *Oil reservoirs, *Drawdown, *Mathematical models, *Fluid flow, Porosity, Porous media, Pressure, Heterogeneity, Unsteady flow.
Identifiers: Buildup, *Interference tests, Matrix Boundary effects, Warren-Root equations.

Both analytical and numerical solutions are offered to the problem of interpreting interference test results in naturally fractured reservoirs. Analysis is based on the concept of the fractured system as having both matrix porosity and fracture porosity. Radial flow to the wellbore is only through the fracture network and matrix flow is into the fractures. Certain other assumptions are made in arriving at the flow equations. The interference drawdown in an observation well while an adjacent well produced at constant rate was examined for five mathematical models representing a naturally fractured reservoir. The flow equations developed by Warren and Root can be used to interpret interference test data. For early time responses, an equivalent homogeneous model does not adequately depict interference drawdown behavior, but for late time responses results are satisfactory. The effects of well spacing and the magnitude of the interporosity flow parameter are briefly cited. (Gray-NWWA)
W74-05086

INTERPRETATION OF BOUNDARY EFFECTS FROM PUMPING TEST DATA,
Geological Survey, Trenton, N.J. Groundwater Branch.
For primary bibliographic entry see Field 8B.
W74-05089

CORROSION CONTROL SPEEDS UP,
Clark, Dietz and Associates, Urbana, Ill. Environmental Engineering Section.
P. Clinebell.
Water and Wastes Engineering, Vol 10, No 11, p 42-46, November, 1973.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, *Sulfur bacteria, Electrochemistry, Hydraulic engineering, *Construction materials, Chemical reactions, Coatings, *Pipelines, Water districts.
Identifiers: Regional water districts, Galvanic corrosion, Pressure fluctuation, Water hammer.

Recently Federal agencies have encouraged the regionalization of potable water supplies number and total length of long distance transmission pipelines for both water and wastewater facilities. This trend emphasizes the need to evaluate fully the material of construction for pipelines to assure protection against corrosion. Other factors related to durability such as soil conditions, terrain, and superimposed loads, should be considered in the design of these essential links to satisfactory service. Metallic pipe because of its chemical nature, is subject to interaction with materials it is transporting or the environment to which it is exposed. This interaction while relatively slow with some pipe materials is more rapid with others and results in deterioration or corrosion of the metallic material. Three commonly recognized types of corrosion are: (1) bacterial or biochemical oxidation; (2) galvanic corrosion or dissimilar metal activity in an electrolyte resulting in dissolution of metals from the exterior of the pipelines; (3) electrolysis or electrolytic corrosion by stray currents generated from external sources. The causes of the different types of corrosion and methods to protect against them are discussed in detail. Also discussed are additional areas that need consideration in the construction of long distribution pipelines. (Hunt-NWWA)
W74-05090

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
S. Vela, and R. M. McKinley.
Society of Petroleum Engineers Journal, Vol 10, No 2, p 181-191, June 1970. 10 fig, 2 tab, 6 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Heterogeneity, *Aquifer characteristics, Porous media, Diffusivity, Permeability, Porosity, Mathematical models, Flow.
Identifiers: *Pulse test, Directional correction, Influence area, *Well pair.

Reservoir transmissibility and storage values can be calculated by inducing pressure pulses in one well and measuring them in a second well. The equations used assume a homogeneous formation. Effects are examined of certain idealized types of areal heterogeneities on the calculated values. An influence area (rectangle) is described for the two wells. Only those heterogeneities within this area significantly affect pulse-test results. The manner in which a pulse test averages heterogeneities within the influence area is described for three limiting cases. These are the cases for which one of the three formation properties (hydraulic diffusivity, transmissibility, and storage) is constant throughout the influence area. A method is developed for the correction of pulse-test values of transmissibility and storage. This 'directional correction' method restores some, if not most, of the true degree of heterogeneity to these values (within the limitations of experimental error and model assumptions). (Gray-NWWA)
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
I. M. Chalet.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p O3-O14, (1969). 12 ref.

Descriptors: *Leakage, *Water loss, *Watertight, Distribution systems, Pipes, Linings.
Identifiers: *Leak detection, Radioactive fluids, Gas dilution.

Leaks in a water distribution system can result in economic losses, decreased abundance of water resources, and the possibility of pollution if pressure falls at the location of a leak. Establishing the existence of leaks includes three possibilities: (1) continuous overall supervision of the network by the Water Authority; (2) incidents coming to light from time to time; and (3) systematic detection campaigns along the network by overall or itinerant methods. Special methods using radioactive fluids, gas dilution, and acoustic and electric-acoustic instruments are described. Other information helpful in discovering leak presence and location includes age of network; depth of pipelines; nature and lining of pipelines; and valves, seals, and cocks used. (Staplin-NWWA)
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8B.
W74-05096

UNUSUAL CASES OF COPPER CORROSION,
Calgon Corp., Pittsburgh, Pa. Corrosion Research Group.
G. B. Hatch.
Journal American Water Works Association, Vol 53, No 11, p 1417-1428, November 1961. 7 fig, 4 ref.

Descriptors: *Corrosion, *Pitting, *Copper, Aluminum, Iron, Zinc, Oxidation, Chemical reactions.
Identifiers: *Impingement, Cuprous oxide, Carbonized residues.

Copper, like other metals used for potable-water tubing, can be damaged from both general and localized corrosion. A thin, very fine grained film of cuprous oxide normally forms on copper surfaces exposed to potable waters; it is tightly adherent and quite highly protective. The effects of dissolved copper on zinc, iron, and aluminum corrosion are examined. Impingement attack is discussed in some detail, and pitting attack is reviewed for the following systems: cold water lines, hot water lines, domestic service lines, and sprinkler systems. Other causes of pitting, such as carbonized residues, are also discussed. (Campbell-NWWA)
W74-05097

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 8B.
W74-05098

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
R. M. McKinley.
Journal of Petroleum Technology, Vol 23, No 7, p 863-872, July 1971. 13 fig, 6 ref.

Descriptors: *Permeability, Flow, *Graphical methods, *Transmissivity, Curves, Theis equation, Wells, *Pressure, Drawdown, Groundwater reservoirs.
Identifiers: Buildup, *Skin effect, *Afterflow, Fall-off, Shut-in.

Afterflow -- the continued influx of fluid from a formation into the wellbore after the well is shut in -- may furnish useful information. Pressure measurements should be more accurate during afterflow than later. The pressure change during afterflow should reflect a dynamic balance between (1) the capacity of the well to store fluid, and (2) the ease with which the formation supplies fluid to the wellbore (i.e., an indication of transmissibility). By the use of a set of type-curves prepared for pressure buildup in a homogeneous, radially finite reservoir, near-wellbore transmissibility is calculated directly from pressure buildup data without assuming formation properties. The generation and use of the type curves are described. Examples are given of the use of type curves with wellbores having a skin, a low permeability streak, and partial penetration. Five examples are given of the type-curve analysis of field data that were difficult to interpret conventionally. Although the examples relate to buildup tests, the method is applicable to drawdown, fall-off, and injectivity tests. (Gray-NWWA)
W74-05101

SELECTION, HANDLING, AND PROTECTION OF DOWNHOLE MATERIALS: A PRACTICAL APPROACH,
Atlantic Richfield Co., Dallas, Tex.
S. M. Bucaram, H. G. Byars, and M. Kaplan.
Materials Protection and Performance, Vol 12, No 9, p 20-26, September 1973. 5 fig, 4 ref.

Descriptors: Corrosion, *Corrosion control, Economics, *Training, *Engineering personnel, Materials, Pitting, Fatigue.
Identifiers: *Production personnel, *Downhole materials, Corrosion inhibition, Handling-caused failures.

A downhole failure control short course was designed as a means to supply production and engineering personnel with the know-how necessary to reduce subsurface corrosion and handling-caused failures. Specifically discussed were failure due to tension, wear, corrosion (both uniform and pitting), fatigue, methods of corrosion inhibition, and the economics of failure control. A study of equipment performance data fol-

lowing presentation of the short course indicated significant reductions in corrosion and handling-caused failures. (Campbell-NWWA)
W74-05102

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W74-05106

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
For primary bibliographic entry see Field 5D.
W74-05269

8H. Rapid Excavation

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

8I. Fisheries Engineering

COMBINED REARING OF THE PIKE-PERCH LUCIOPERCA LUCIOPERCA (L.) AND ROACH RUTILUS RUTILUS HECKELI (NORDM.) IN LIMAN FISH FARMS OF KUBAN, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
E. P. Tsunikova.
Vopr Ikhtiol. Vol 12, No 6, p 1073-1078, 1972.
Identifiers: *Fish farming, Liman fish farms, Lucioperca-lucioperca, Perch, *Pike-perch, Productivity, Rearing, Reproduction, *Roach, Rutilus-Rutilus-Heckeli, *USSR(Kuban), Fish foods.

Study of the habitats of young pike-perch Lucioperca lucioperca and roach Rutilus rutilus heckeli, degree of similarity of their food, and relative competition showed the expediency of their combined rearing in the estuarine fish farms of Kuban (USSR). With the combined rearing of the young of these fishes the food base is utilized more completely. The rearing of young pike-perch alone does not noticeably increase the effectiveness of its reproduction, but leads to a decrease of the fish productivity of bodies of water.--Copyright 1973, Biological Abstracts, Inc.
W74-04923

HOOD CANAL POND REVISION,
Washington State Dept. of Fisheries, Olympia.
R. Webb.
Available from NTIS, Springfield, Va 22151 COM-72-11198 Price $3.00 printed copy; $1.45 microfiche. Project Completion Report to NOAA, National Marine Fisheries Service, July 1972. 5 p, 3 photo. AFC-53.

Descriptors: *Fish hatcheries, *Washington, *Fish management, Fisheries, *Chinook salmon, Fish handling facilities.
Identifiers: *Fish holding ponds.

The concrete release pond at the Hoodsport Hatchery, Washington, was reconstructed into an adult holding pond so as to permit species segregation. When not in use for adult holding, it is to be used for juvenile rearing of chinook salmon. This is estimated to increase the station production by 15,000 pounds annually. (Knapp-USGS)
W74-05157

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
For primary bibliographic entry see Field 5C.
W74-05356

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
For primary bibliographic entry see Field 5C.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
For primary bibliographic entry see Field 5C.
W74-05359

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

9C. Research Facilities

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W74-05227

9D. Grants, Contracts, and Research Act Allotments

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W74-04924

10C. Secondary Publication And Distribution

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05005

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 02F.
W74-05017

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 02B.
W74-05169

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 05B.
W74-05284

10F. Preparation Of Reviews

KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
For primary bibliographic entry see Field 05D.
W74-05110

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 05D.
W74-05282

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W74-05292

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American Water Works Association Research Foundation, Public Water Supply Treatment Technology	W74-05006	1
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

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3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

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